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Improved Horse-Power Drilling Machine.

The sinking of wells by drilling, or what is commonly known among engineers as the "Artesian" system, is in many sections the only method of obtaining a permanent supply of pure water. In any locality it offers one important advantage over that of open wells, namely, the exclusion of surface water, which, unless great care and extra cost are expended in their construction, is apt to drain and leach into open wells, and contaminate their waters.

In sinking Artesian wells, or in boring for oil, when anything more than a few feet of earth, or rock, are required to be penetrated, the increasing weight of the drill attachments necessitates the use of greater power than manual labor can supply. In most localities, and for ordinary boring, the power of horses is more conveniently obtained than any other, and the object of the invention of which we give engravings herewith, is to furnish an improved system of applying such power to the purpose specified.

For this device the following advantages are claimed, viz: that it can do a given amount of work with less power than other appliances of the same class hitherto used; that it can be set up anywhere, on uneven ground, or in other circumstances of difficulty, and the horse power may be placed at any reasonable distance from the derrick, say, 200 feet; that it will give any length of stroke, from three inches to three feet; and that it is so easy of transportation, and can be set up with such facility that it may be transported five miles and all its parts adjusted to work the same day.

Fig. 1 is a perspective view of the apparatus, and Fig. 2 is a detail, showing in larger size, and more fully, the parts of the horse power.

MERRILL'S IMPROVED HORSE-POWER DRILLING MACHINE.

The horse is attached to the sweep, A, Fig. 2. This sweep imparts motion to the gear, B, and through it to the pinion, C, and the revolving lever, D. The revolving lever, D, is provided with friction rollers at its extremities, and actuates the lever, E, which, through the connecting rod, F, and chain, actuates the lever, G, Fig. 1. From this lever, G, a chain connects with a rope passing over a pulley at the top of the derrick to the drill, as shown.

Whenever the revolving lever, D, Fig. 2, disengages with the lever, E, the end opposite the lever, E, engages with the friction plate, H, Fig. 2, which affords sufficient resistance to prevent a sudden jerk upon the horse. This plate is provided with strong rubber springs, which, pressing it against the friction rollers on the revolving lever, give the required resistance.

In raising the drill out of the bore, a windlass and rope are employed, as shown in Fig. 1, the end of the rope being fastened at I, when not needed. As further assistance in raising the drill, when it becomes stuck in the bore, a workman places his feet on the lever, G, and seizing with his hands the bars, J, is enabled to exert a powerful leverage upon the drill, through the rope connecting it with the lever.

We are informed that this machine has already received an extensive application in boring wells, in various sections of the country, and that it is satisfactory in all respects.

Patented, May 4, 1869, through the Scientific American Patent Agency, by C. L. Merrill, whose address for machines or rights, at Watertown, N. Y.

PITTSBURGH has thirty-two iron, nine steel, and two copper mills. The daily consumption of the iron mills is 1,200 tons, and their annual production $23,000,000. There are forty-eight foundries, employing two thousand men in all, and adding $5,000,000 per year to the wealth of our country.

CURRENCY OF JAPAN.

[Condensed from the Mechanics' Magazine.]

In Jeddo there were, up to a comparatively recent period, three separate establishments devoted to the production of coin. One of these was appropriated to each of the three metals employed. The gold mint, however, was destroyed by fire a few years since, and it has not been and will not be rebuilt. When in existence, no foreigner was allowed to inspect it, and therefore nothing authoritative can be said of its internal organization. The building, or series of buildings, rather, devoted to the coinage of silver money, is situated in a narrow street in the mercantile quarter of the capital. On entering the silver mint, the eye of the European would be first attracted by the extraordinary positions assumed by the work-people. Groups of men were seen in all directions, squatting on the ground and engaged in weighing, hammering, cutting, sorting, and packing the metal. A few officers, controlling the operations and giving instructions, moved about among the squatters. Let us take as an example of the

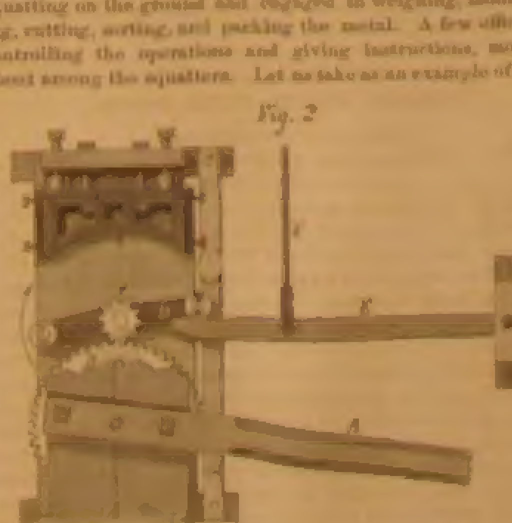


Fig. 2

processes carried on in respect of all the denominations of silver coin, the production of the itzebus of that metal. For the sake of simplification of description, we may speak of the past as if it were the present time.

A massive block of silver of the requisite degree of fineness, as determined by assay, is placed in an iron ladle and reduced to a molten state by aid of a charcoal fire and a pair of blacksmith's bellows. The metal is poured into molds, that shape it into thin, rectangular bars, which are removed as soon as solidified and plunged into cold water. From the bath they are removed and handed one by one to a seated workman, who trims off their ragged edge by means of a pair of shears fixed to the ground. Another workman receives and improves their surfaces by hammering them. A third coiner, prepared with a pair of scales, weighs the bars and divides them into parcels, and a fourth shears them to the requisite length. The next operation is that of shearing the bars into short lengths, equal to that of the coin itself. Each bar yields eight coins. Another series of weighing now commences, and this demands the exercise of considerable skill and care, as it is also a test of the judgment with which the cutter has performed his task. The planchets which are below legal weight have to be returned to the melting ladle. Those which are correct in this respect are passed forward, and those which are too heavy are reduced by aid of shears. All the accepted planchets have next to be annealed and blanched.

These processes are effected by heating the embryo coins to redness over a charcoal fire, plunging them into cold water, and then immersing them in a bath of boiling acid. From this latter the planchets emerge with whitened or frosted surfaces of fine silver, the acid having attacked and dissolved the alloy. They are next planished on both sides by means of a flat-faced hammer. The edges are touched slightly in a similar manner, and thus the blank slips are made ready for stamping.

This operation is simple in the extreme. A workman places a single planchet, with thumb and finger, on a die firmly fixed, and resting on a solid bed. With his right hand he places another die on the top of the silver piece. A sledge hammer, wielded by an assistant, is the coining press.

The hammer, dexterously handled, falls in rapid succession upon the upper die, until the impressions—not very elaborate, but indicating the value of the coin—are completely transferred to both sides of the piece. When about a hundred have been thus dealt with, they are advanced another stage. A frame, so contrived as to receive that number on edge, stands near at hand, and boys place the itzebus within it. Small, star-like indentations are made by force of hammer on the edges of the coins, and this is the finishing touch in the manipulatory processes. Another weighing, however, takes place before the new coins are pronounced fit for circulation. It may so happen that the acid has bitten off too much metal from a small percentage of them, and the final test weighing decides this point. Those which are below a certain weight are returned to the ladle; the others, certified by the addition of an imperial stamp, are true and current money of the realm. In quantities of one hundred, the latter are packed carefully in stout paper, upon which a seal is imprinted, to guarantee to the public the number and quality of the coins within.

The order observable in the silver mint of Jeddo is remarkable. The men, as a rule, work as silently as if they were machines, although there are some hundreds of them engaged. When they enter upon their duties in the morning, they divest themselves of their garments—which are also rather primitive—and don clothes which are the property of the government. At the close of each day's work a gong is sounded, and its effect is magical. Some three hundred men and boys spring to their feet instantaneously. Divesting themselves of their working suits with a rapidity equal to that which distinguishes clowns and pantaloons under process of transformation at a London theater, they scamper across the mint yard, and perhaps leap over a few hurdles in

their course. Their object is to pass as quickly as possible through a very disagreeable ordeal. They have all to be searched before leaving the establishment. The task is rendered less difficult than usual from the fact that when it is performed they are not encumbered with clothing of any kind. The examination, however, is rather more minute than would be pleasant to Europeans. Their back hair is carefully combed out, they wash their hands and hold them up to the view of the inspectors, take a draft of water, and are made to bawl loudly. Lastly, they are allowed to resume their morning costume and return to their respective homes.

ELECTRICITY NOT A DUAL FORCE.

BY RICHARD RIDGE, B.A.

Calorimetry teaches us that heat propagates itself through certain bodies with greater facility than through others. Some bodies likewise transmit electrical force better than others; those offering a ready passage are termed, in electrical science, *conductors*, and those offering a high resistance, *insulators*. Conductors and insulators are the same in kind, but differ in degree. Experiment proves that the best heat conductors are the best conductors of electricity. The following table will show the relative conductivities of various metals:

	Electricity. Matthiessen.	Heat. Wiedemann.
Silver	100	100
Copper	77·4	73·6
Gold	55·2	53·2
Sodium	37·4	..
Aluminum	33·8	..
Zinc	27·4	28·1
Potassium	20·8	..
Iron	14·4	11·9
Tin	11·4	15·0
Platinum	10·5	8·4
Lead	7·7	8·5
German silver	7·7	6·3
Antimony	4·3	..
Mercury	1·6	..
Bismuth	1·2	..

It will be seen that they generally agree as to order, but differ as to numerical relation. This difference may be accounted for by variations in the purity of the metals tested. The similarity in conductivity shows that electrical force and heat force are nearly allied. There then remains two theories by which we may explain the transmission of electrical force. Heat is supposed by most physicists to be the result of the vibration or motion of the atomic particles composing bodies, and this vibration produces the sensation of heat to our nerves. So far it is easy to follow the theory, but it is further stated that the vibrations which cause heat, take place not only among the atoms of which bodies are composed, but also in an ether supposed to surround each atom. This is difficult to understand, for if we consider gases or air to be made up of atoms, it is next to impossible to suppose that there is some intermolecular medium not made up of atoms, and which is yet not vacuous space, even though we may name it, mysteriously, ether.

The other theory is that so ably raised in reply to Faraday's objection that, if space be vacuous it must be an insulator, and there can be no transmission of electricity from particle to particle, and that therefore space must conduct. It has been answered that "if space be an insulator, and if a conducting atom charged with electricity can move through space into contact with another conducting atom, then there can be a transmission of electricity from atom to atom." In proof of this theory experiment has shown that, in liquids and solids subjected to electrical currents, there is molecular motion.

We have next to consider the kind of motion imparted to each atom, and here we must be content with theory alone. It can be inductively reasoned that the motion is circular, for as we conceive an atom to be circular in form, we must suppose it to follow the general law that when motion has been imparted to a spherical body, it revolves on its own axis in a direction answering to the line of force; a cannon-ball revolves in its passage through the air, and the earth itself in its passage through space. Regarding a conducting wire as a line of atoms, we know that if motion is imparted to one end of the line, it will be transmitted to each succeeding atom till the distant end is reached.

Let the reader take a dozen marbles, and place them in a line in the groove formed between the pages of an open book; let the nearest marble be struck, and the motion will be transmitted to the whole line, the last marble rolling some distance away. Let a spring that will always give the same force be arranged, and let the number of marbles be varied. It will be seen that the end marble moves farther away as the number is decreased; affording a good illustration that the force increases inversely as the length of the conducting line. Let now a sheet of paper, or a book, be placed perpendicularly for the end marble to strike against, and the marbles arranged in any number of lines—say three. If the three lines are impelled forward by the same motive power—a pencil held so as to strike the three lines at one time—the three end marbles will be impelled forward to the paper or book. Suppose that it were possible to register this action on the paper as three indentations, each of the same value, made in one second of time, it is plain we should have to impel one line three times—or once with three times the force—to produce the same value of indentation, and three times as fast to obtain three indentations in one second. The first result answers to electrical quantity, and the latter to electrical tension. We also see that with the greatest quantity the greatest amount of work is done, the resistance to be overcome being the same. Quantity, then, varies with the area affected; tension, with the number of times force is transmitted in a given time.

Having obtained some idea of the action of an atom when subjected to force, we have next to consider the direction of our force. If we consider electricity as a force, we must consider the normal atomic state to be that of comparative rest. Regarding an atom as a point in a line of force, the force tending towards that atom will be positive or negative to the force tending from the atom; positive and negative being used in the mathematical sense as referring to opposite directions. Electricians have termed that the positive current which flows from the copper pole to the zinc pole, or, inside the battery, from the zinc plate to the copper plate.

If the reader will make the following simple experiment, he will see that the positive current is the only visible current in a closed galvanic circuit. Take a battery and connect a piece of wire one end to each pole; sever the wire at any point, and apply the two ends to the tongue. On the side touched by the wire attached to the copper pole a sharp pricking sensation will be felt, and on that side only. Insert a galvanometer between the severed ends, and mark the direction of the index. Join up the severed wires, and insert the galvanometer in any other part of the circuit, the index will still point in the same direction, proving that there is but one current—that from the positive, or copper, pole. It would seem, then, that when electrical force is developed by chemical decomposition, the normal state of rest is destroyed, and force is imparted to the particles of the collecting plate and thence to line.

There is ground, then, for the supposition that the current flows from the seat of action in one direction only. In further proof, Faraday's experiment with a silver-copper couple may here be quoted. Let two plates, one of silver, the other of copper, be placed in a vessel containing sulphuret of potassium. The needle at first deflects in a direction which shows that the copper is the positive element of the pair; it then gradually returns to its first position, and again deflects in the opposite direction, showing that the silver is now the positive element. After some time it returns, and again deflects in the opposite direction, and goes on thus changing. If the plates be examined during these changes, it is observed that sulphuret of silver is formed when the silver plate is positive, and sulphuret of copper when the copper plate is positive.

Nowhere is there any indication of more than one current. What reason, then, is there to suppose electricity a dual force? —in a closed galvanic circuit we have seen that there is but one force exerted in one direction. The only phenomenon that can be supposed to give rise to the idea that two forces are set free occurs when earth is made to complete the circuit. The battery then appears to draw up a current from earth to zinc—note that the direction is still the same—as well as send a current from copper to earth. Before we suppose another force to account for this flow, let us see if it could not be produced by the already existing force. Imagine that the wire is a tube of water and that, at the point indicated by the battery, a force is applied which imparts motion to part of the water on the tube. We know that the rest of the water will flow in the same direction.

To return to our conducting wire: electrical force has been, and is being generated, the atoms in one part of the circuit are impelled forward to the limit of their space, and in their rear, so to speak, a kind of vacuum has been formed, having a tendency to increase, which the atoms in the other portion of the conductor endeavor to fill up, and, in the endeavor, are set in motion.

If this theory be true, it has the advantage in its favor that it does away with the complication of currents so difficult to the tyro in electrical science. Above all should we remember the aphorism, *Natura simplex est*.

Perhaps the greatest phenomenon of electricity is that it both produces, and is produced by, magnetism. Let us then define electricity to be, a force capable of generating, and being generated by, magnetism.

In a short time, the writer hopes to submit to his readers the application of this definition and of Ampère's beautiful, because practicable, theory to the phenomenon of static electrical force, and induction.—*Electric Telegraph and Railway Review.*

PARKER'S AIR-JET STEAM ENGINE.

[Condensed from Engineering.]

It is a condition of the position which we occupy that a large number of new inventions, or inventions supposed to be novel, are submitted to us every year. These inventions apply to almost every branch of mechanical science, and are for the most part either novel and worthless, or good and old. It is seldom indeed that we meet with an invention both novel and good at the same time. In the majority of instances we are expected to pronounce a favorable opinion by sanguine inventors. It is our misfortune, not our fault, that this favorable opinion is seldom, if ever, pronounced. It is never pronounced until we have satisfied ourselves by direct experiments, or the testimony of impartial and able judges, that the invention deserves to be well spoken of. Not a few of the inventions which have been recently brought under our notice apply to the production of power. They either constitute improvements on the steam engine, or in other machines intended to fulfill the same purpose.

The most noteworthy of these inventions consist mainly in combining air with steam, and using the combined fluid to actuate a piston or pistons. We seize this opportunity to state for the information of inventors that we pursue an invariable course when we are asked to witness trials of such novel apparatus. We are willing to inspect the machine at any time, but we decline to write a word about it for publication, unless we are afforded an opportunity of testing the invention fully and fairly. Very frequently such a test is refused altogether; in other cases it is submitted to, only under limitations which we decline to accept; most rarely we are told that the engine is at our disposal to do what we like with it. This last is precisely what Mr. Parker, the present owner of the patents taken out some years ago by his brother, has done, and it is fair to add that Mr. Parker is the only individual who has as yet given us the opportunity of determining by direct experiment, whether there is or is not any practical saving in fuel to be gained by mixing air with steam. We have never yet even seen a Warsop aero-steam engine at work. We were invited to examine a Galloway air engine, which we declined to do unless we were afforded permission to test it, of which offer no notice whatever was taken. The Marchant aero-steam engine is not yet ready for the test to which Mr. Marchant states he is quite willing we should submit his invention. It is the fault of other inventors if Mr. Parker's engine appears to receive an amount of attention in our columns denied to kindred machines.

We have already fully described the nature of Mr. Parker's invention in our impression of May 6, 1870. It will suffice now to recall to the recollection of our readers that the steam flowing from the boiler to the engine passes on its way through certain jets by the agency of which air is drawn in, as water is by an injector, which mixes with the steam, expands, and aids in the production of power within the cylinder. We have, in the impression just referred to, given particulars of one experiment which we carried out with all possible care. We desire now to call attention to another trial made with a much better engine in a somewhat different way—a way intended to secure the greatest possible accuracy.

To this end the steam, and the mixture of steam and air, were used under precisely the same conditions. Steam was raised in a vertical cylindrical boiler with twenty-four square feet of heating surface. The fuel used was coke. There was no blast or jet in the chimney, or other means of urging the combustion of the fuel. The arrangement of the steam and steam-air pipes was such that nothing more was required than the turning of a couple of cocks to put either system of pipes in use to the exclusion of the other. The engines are horizontal, $3\frac{1}{2}$-in. cylinders, by 6-in. stroke. The fly wheel was fitted with a brake, and loaded with 21 pounds.

In order to eliminate all the chances of error which may accrue when the economical efficacy of an engine is estimated by the consumption of fuel, we determined that the test should be intended to determine the amount of work which could be got out of a given weight of water when steam was used in the ordinary way, and the amount of work which could be got out of a given weight of water when a mixture of steam and air passed through the engine. The water was all measured gallon by gallon into a bucket, from which the pumps drew, so that no error other than one of infinitesimal amount could be made as to the quantity used. The load on the brake remained the same in both experiments. The number of revolutions was taken by a counter; each experiment lasted precisely one hour. The following is the result:

STEAM.

Started.	Stopped.	Consumption of water in gallons.	Total number of revolutions.	Revolutions per gallon.	Revolutions per minute.	Boiler pressure.
h. m.	h. m.					lbs. lbs.
11·37	12·37	15	9375	628·33	156·562	55 to 60

STEAM AND AIR.

Started.	Stopped.	Consumption of water in gallons.	Total number of revolutions.	Revolutions per gallon.	Revolutions per minute.	Boiler pressure.
h. m.	h. m.					lbs. lbs.
1·11	2·11	15	11762	[illegible]	196·7	50 to 55

From these figures it will be seen that steam alone only did, in round numbers, 70 per cent of the work done by steam and air mixed. In other words, the use of the combined fluids effected a saving of about $41\frac{1}{2}$ per cent. Neither the actual power developed nor the consumption of fuel was noted; as on former occasions the steam pipe, $1\frac{1}{2}$-in. in diameter, which receives the mixture of steam and air from the nozzles, and conveys it to the cylinders, passed through a small coke fire for about 20 inches of its length.

We are informed that this little superheating apparatus is found to promote economy very much. That it promotes it to some extent is certain, but it must be to a very moderate degree. We have heard it asserted that to this fire, and to this alone, the whole economy of the Parker system is due. To argue this point on one ground alone, it is evident that those who make the absurd assertion tell us directly that 20-in. of $1\frac{1}{2}$-in. steam pipe, or, in other words, say ninety square inches of heating surface or thereabout, is so efficient that it can increase by 40 per cent the economical efficiency of a steam engine supplied by a boiler producing 24 feet of heating surface. It is unnecessary, we think, to waste time in refuting such an error.

RUSSIAN COTTON FACTORIES.—Russia has 667 cotton factories, employing 180,000 operatives. Before the war in this country cotton manufacture had scarcely commenced in Russia. During that period, however, the Russians began to manufacture Bokhara, Persian, Indian, and other cotton, and it is said that their factories are now the most magnificent in the world, exceeding in style and completeness even the English establishments. The products amount to $50,000,000 annually.

THE BEECH AND ITS PRODUCTS.

BY W. A. [illegible], A. M.

The common beech, or *Fagus sylvatica* of the ancient Romans, is described by botanists as a beautiful tree, from 40 to 100 feet in hight, with a thin, smooth, whitish bark, and common to various parts of America and Europe. The wood, from its hardiness and uniform texture, is highly valued for making plane-stocks, and various other mechanical implements, shoe-pegs, etc., and when dry it is much used for fuel, especially in Paris, where it is called "*bois d' andelle*." Its shavings, previously soaked in vinegar, are employed in the manufacture of the so-called white wine vinegar by the quick process. One pint of alcohol of 80 per cent is mixed with five or six parts of water, to which is added a minute proportion of yeast, honey, or extract of malt, and this mixture, heated to 80 degrees, is made to pass slowly through a perforated cask containing the shavings, after passing the mixture three or four times through the loose shavings, it is completely converted into acetic acid. The beech-wood shavings are found preferable for this purpose, because they contain no essential oil which would arrest the acetous fermentation, and no marked or disagreeable flavor which would be imparted to the vinegar.

Beech wood, when dried and subjected to the destructive distillation, yields water, wood naphtha, tar, and pyroligneous acid, and is one of the woods preferred for this purpose.

Next in importance to the wood of the beech, yet scarcely inferior, is the fruit, or nut, called in many parts of England "beech mast," where it is extensively used, as it also is in this country, and especially in some of the Middle and Southwestern States as food for swine, which, before the mast has ripened, are turned in herds into the beech forest, where they remain till the time for slaughtering. The fruit consists of a capsule or *bur*, as it is sometimes called, containing, when perfect, two sharp-cornered, triangular nuts, of a pale, reddish brown color, and having within each a white kernel of a rich, pleasant taste, and abounding in a clear, yellow, inodorous oil, which may be obtained by hot or cold expression, in the same manner as that of the castor oil bean, cotton seed, etc. The usual yield is about 16 per cent. The nuts, which, at the early frosts of Autumn, fall to the ground by the opening of the capsule, and are usually gathered by children, are deprived of their shells before expressing the oil, and the residue, or oil-cake, is excellent as food for cattle, swine or poultry. This use of beech-nuts, however, is seldom made in this country or England, the principal harvesters being swine and turkeys; but in France, and some other parts of Europe, this branch of industry becomes a source of considerable profit to the inhabitants.

The oil, when obtained by the cold process, is at first slightly acrid to the taste, but this property is wholly dissipated by keeping a short time, or by boiling with water.

At 60 degrees Fahrenheit, it has a specific gravity of 0·9225, and at 29 degrees, it becomes solid. One thousand parts of alcohol of 90 per cent will dissolve four parts of the oil, but it is completely insoluble in water. Its composition is carbon, 79·77; hydrogen, 10·57; and oxygen, 9·12, with a trace of extradine matter, etc., in each one hundred parts. Like other expressed oils, it produces *acrolein*, or the hydrated oxide of acryl, by destructive distillation at a high temperature. By treatment with nitric acid, it also, like other nut oils, yields *elaidin*, or *elaidic acid*, in combination with *oxide of glyceryle*, and in about 103 minutes is, by this process, converted into a bluish green solid. The soap made from this oil is of a dirty gray color, becoming yellow by exposure to the air, and having a slightly characteristic odor of the oil. It is somewhat greasy and pasty, and for these reasons is less valuable to the soap-maker than many other kinds of vegetable oils, though in France it is extensively used for this purpose. Three pounds of the oil will make five and a quarter pounds of soap, as taken from the frame, which, in two or three months, by drying, will lose a considerable portion of its weight.

Beech-nut oil, however, is most valuable for culinary and lighting purposes, for the former of which it is considered very wholesome and palatable, and to a great extent takes the place of butter and lard among the French and German inhabitants of certain districts, and when used for the latter, it burns well, gives a good light, which is free from smoke.

When properly refined it is good for lubricating delicate machinery, such as clocks, etc., and for the preparation of hair-oils, pomatums, liniments, ointments, and for many other purposes it is not inferior to most of the vegetable fatty oils.

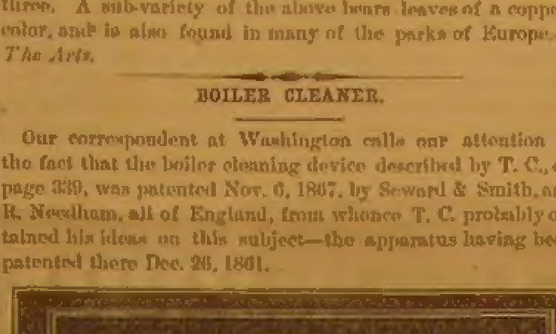
As the flesh of swine and poultry fed upon beech-nuts is apt to be soft and oily, it is, therefore, somewhat strange that the oil is not expressed to a greater extent in this country, and the residue sold, as it readily could be, for feed. Probably, if our Western pork and poultry were fed upon this cake and afterwards fattened upon corn and water or ground feed, they would bring a higher price, while at the present day they bring less than those which are fattened in New York, Pennsylvania, or New Jersey. This branch of industry affords a good opportunity for some party of capital and enterprise to add to his finances and to the list of the useful arts which are carried on in this country.

The bark of the beech, although not abundant in quantity or weight as compared with other portions of the tree, is sometimes used in tanning leather, and yields by analysis about two per cent of tannin. Although occasionally employed for this purpose, we believe that other articles are most generally substituted.

Several species of the beech are known, but they are mostly allied to each other so intimately as not to require a separate description. One remarkable variety, the original of which was found in a forest of Germany, nearly one hundred years ago, puts forth leaves which at first are of a cherry-red color, but when they attain their full size become a very dark purple. Though this variety has become quite common as an ornamental shade-tree in the parks and pleasure-grounds of Europe, we are not aware that any specimens have ever been planted in America except in the Central Park of New York, which, as we are informed, contains two or three. A sub-variety of the above bears leaves of a copper-color, and is also found in many of the parks of Europe.—*The Arts.*

BOILER CLEANER.

Our correspondent at Washington calls our attention to the fact that the boiler cleaning device described by T. C., on page 339, was patented Nov. 6, 1867, by Seward & Smith, and R. Needham, all of England, from whence T. C. probably obtained his ideas on this subject—the apparatus having been patented there Dec. 26, 1861.



Annexed is a sketch of another device for the same purpose from a rejected application filed by G. Ortleib, in 1852. It consists of a series of funnel-shaped vessels, *a a*, connected at their bottoms to a horizontal tube, *b*, having at its outer end a blow-off cock. The tops of these vessels reach to near the top of the water, and the scum settles in them and is blown out in the same way as in the apparatus described by T. C.

The Value of American Hemp in Medicine.

Dr. H. C. Wood, Jr., has written an essay, which he read before the Amer. Phil. Society, in which he records some experiments with an article of hemp grown in Kentucky. He took an alcoholic extract made from the dried leaves, swallowing at a dose nearly all the product of an ounce and a half of the leaves, with the effect of profound hemp intoxication. It proved to be toxic in its power, although he recovered himself in a day or two. He had all the exuberant hilarity usually experienced from the hemp, followed by a feeling of fear of impending death; this took so deep a hold on him that it was impossible to shake it off.

Other trials he has made with it convince him that it has more power than that brought from India, on one occasion four times the dose of the latter failing to produce the effect of the Kentucky specimen.

He has his extract made from a tincture, removing certain inert matters by an alkali; he intimates the hope that in the present revision of the U. S. Pharmacopœia the *ex cannibis purificatum* may be replaced by a preparation to be called *Resena cannibis*, and to be made by precipitating the concentrated tincture by water rendered strongly alkaline by soda or potash.

The native plant, if used, will always be more reliable than the imported, from the certainty of freshness, while the cost of it is hardly anything.

WEAR OF RAILS—LONDON UNDERGROUND RAILWAY.

A friend of ours while in London a few weeks since, was very courteously treated by the Chief Engineers and Assistants of the Underground Railway; he was shown, among other things, a new piece of rail, such as is used on the line, and a piece taken up from near one of the stations after being in three months. The great wear in so short a time, as shown in the accompanying sketch, is due to the fact that trains are run every two or three minutes; the stations being on an average about half a mile apart, it is necessary to run without slackening speed until very near the stopping places, when the brakes being applied, the wheels cease to revolve, and the whole train slides along bodily, while sparks fly off the rail as they do from a wheel when a tool is being ground; by this means the train is brought to a sudden stop with trifling loss of time. If this were not done the company could never accommodate the vast number of passengers who patronize the line.

American Colleges.

The typical American college ranks but little, if any, higher than the typical German gymnasium in the amount and quality of its mental training. There has been a great deal of boasting about our system of public education, as if it excelled every other in the world; while in fact we are far behind the Germans in point of popular intelligence. We are far from wishing to disparage any true American merit; but it is foolish, not to say dangerous, to give undue importance to events and results merely because they have been brought about by us as a people.

It is better to look at our own institutions and at those of other lands with the naked eye of criticism than to gaze at the one through the magnifying lenses of self-glorification, and then, reversing the glass, to belittle the other. The existence of our democracy very much depends on the thorough and universal spread of intelligence among our masses. We entertain no fears that the standard of popular education is to be made lower. On the contrary we expect to see it continually rising.

Every factor in our system has a part to perform in this work; and it seems to us that the governing bodies of our colleges and universities have it in their power to accelerate this movement. Let the standard of admission and scholarship be raised in our colleges, and at once the preparatory schools come up to a higher plane. The whole commonwealth is made sensible of an advance. Let the men who form the vanguard of our army of instructors move forward, let the word go through the rank and file, "Onward!" and our American universities will one day compare favorably with those of Europe.

Figures have lately been presented to the public showing that in New England the attendance at colleges for the past few years has been less in proportion to the population than in former times. This surely is not flattering. One cause of this was the late rebellion. Another cause is the popular notion that self-made men are never college graduates. This fallacy is to be combated and exploded. The people must be taught that the college is the place where a young man may best fit himself for the duties of American citizenship. Again, we as a nation are too much in a hurry. Our young men plunge into business or take up some profession before they are half prepared to make their career a success. It will require a long, long time, and much labor, to check this over hasty tendency, and to create a public opinion in favor of a long and close course of study. But we think it can be done.

Our history will one day have taught us its lessons, and on that day it will be felt that our ablest, our truest, our strongest men are those who have plodded patiently through their studies, who sifted the details and made clean work wherever they went. May it be our privilege to give some impetus to the cause. May we all do what we can to influence our fellows to give their earlier years to earnest work in the fields of art, science, and literature.—*Cornell Era.*

India Rubber Inexhaustible.

The belt of land around the globe, five hundred miles north and five hundred miles south of the equator, abounds in trees producing the gum of india rubber. They can be tapped, it is stated, for twenty successive seasons, without injury; and the trees stand so close that one man can gather the sap of eighty in a day, each tree yielding, on an average, three tablespoonfuls daily. Forty-three thousand of these trees have been counted in a tract of country thirty miles long by eight wide. There are in America and Europe more than one hundred and fifty manufactories of india-rubber articles, employing some five hundred operatives each, and consuming more than 10,000,000 pounds of the gum per year, and the business is considered to be still in its infancy. But to whatever extent it may increase, there will still be plenty of rubber to supply the demand.

Paper Clothing.

According to French journals, we have discovered a new kind of paper in this country, characterized by unusual flexibility and toughness, admirably adapted for clothing of all kinds. The cost of the material is so cheap that a suit of clothes can be had for one dollar. Besides clothing, we are also credited with the preparation of napkins, table-cloths, and pocket handkerchiefs. The veracious Frenchman asks how such clothing will bear the rain, and presumes that it is made water-tight in some way, and thus weather proof. He also adds that this kind of paper clothing is intended for the poorer classes, and that it is impossible to distinguish it from the genuine cloth.

The author of this information must have taken lessons of the French ministry before publishing it to the world. It is about as correct as the news now served out to the people by the "Provisional Government."

Result of a Paragraph.

J. A. Elston, of Elston Station, Mo., writes as follows: The little notice in the SCIENTIFIC AMERICAN of my sewing machine, for which you obtained letters patent for me, has elicited inquiries from Canada to Texas, and from Florida to California, so that I am unable to answer half of them.

Improvement in Burglar-Proof Safes.

That the construction of safes has not been brought to its highest degree of perfection is evidenced by the fact, that every now and then the public is startled and alarmed by the news that some one or other of these devices upon whose impregnability entire confidence had been reposed, has been opened, and a rich harvest gathered by expert burglars.

The problem to be solved is, how to construct a safe so that within the limited time during which burglars can operate, it may resist any and all means of attack. The inventor of the safe which forms the subject of the present article, and of which the accompanying engraving is a good representation, claims that he has solved this problem.

The advantages claimed are: Reduction of the number of external plates; avoidance of homogeneity in the materials used, by which drilling is rendered difficult; the nicety of fit in the joints, and the avoidance of any bolt-holes through the external plates; the attainment of a cylindrical form by which the strength of the structure is greatly increased; provision against the oxyhydrogen blow-pipe, by constructing the body, back, and door of alternate plates of iron, and ribbed steel and iron welded together and hardened by a new process; the interstices of the ribbed steel, and each plate being thoroughly embedded into and filled up with a preparation to resist both heat and the drill.

The outside plate of the body of the safe consists of one immense hoop or plate, which is bent into shape on a former, the power used being that of an hydraulic apparatus, exerting a force of 220 tuns. This hoop when bent is, as intimated above, of the form of a cylindroid, the usual rectangular corners being truncated, or more properly rounded at top and bottom. The same may be said of all the interior plates.

Inside the exterior hoop or plate are four others. The one next the external shell is of iron and ribbed steel welded together. The backing of tough iron to which the steel is welded, prevents the breaking of the plate by sledges or other means.

The next, or third hoop, is of iron, and fits within the second, and the fourth plate is a compound one of iron welded to ribbed steel like the second one described. The fifth plate is of iron, which forms the lining of the safe.

The plates are bound together as follows: The central iron plate has countersunk holes drilled in it to receive a corresponding number of bolts. The compound iron and steel plate receives a like number of perforations through which the bolts pass into the central plate, and penetrate the outer plate to within half an inch of its outer surface. The bolts are steel pointed, and therefore a tool striking one of them would be stopped or diverted. Thus the three outer shells are bound into one solid body. The two inner plates are likewise held together by the same number of bolts countersunk into the outer face of the central band.

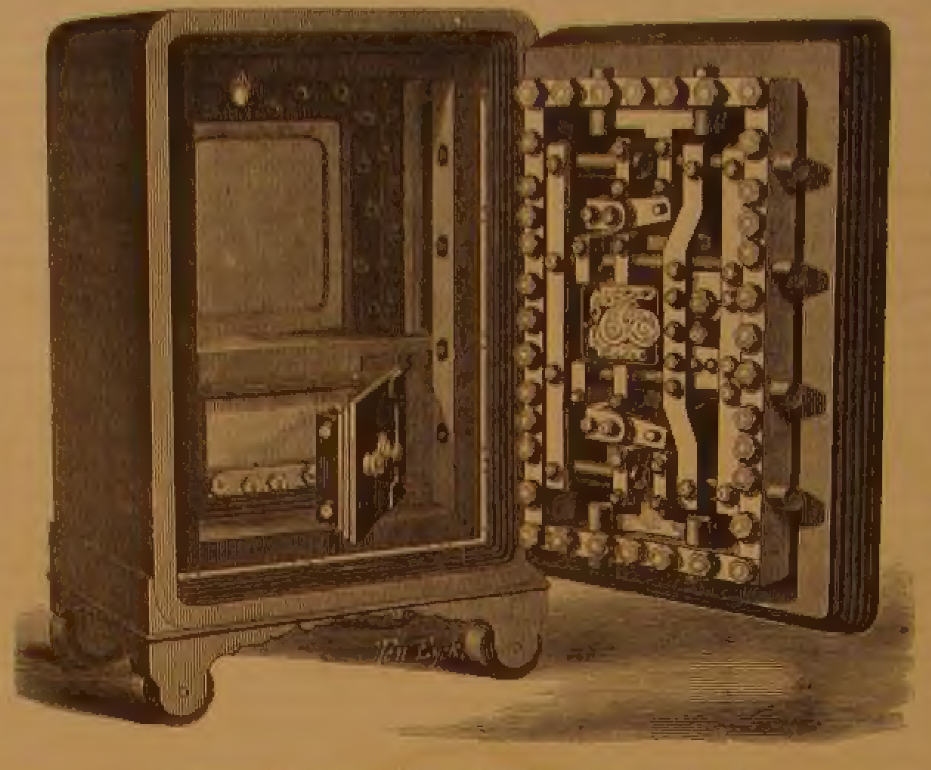
The use of the blow-pipe is also defeated by such a mass of metal conducting away and dispersing the heat.

The back and the door are composed of similar plates and bolted together in the same manner. The back is attached to the side walls by angle irons extending entirely around the safe.

The method of jointing by ledges or steps, is a precaution against the use of the wedge.

The guides of the locking bolts are attached to the plates of the door by bolts. The jams into which these bolts slide are designed to be the strongest part of the safe. They extend entirely around the inner front of the safe, and are attached to the body from the inside.

A double metallic spring, with rubber face, is fitted into a recess in the door. The door, in closing, shuts down upon this packing, and makes an air-tight joint. Various patents on this safe, bearing date from November 30, 1869, to March 15, 1870, have been obtained, through the Scientific American Patent Agency, by William McFarland, of Brooklyn, N. Y. For further information address Tilton & McFarland Safe Manufacturing Co., 95 and 97 Liberty street, New York.



THE DREADNOUGHT BURGLAR-PROOF SAFE.

Improvement in Ring Packing for Pistons.

Of all methods of packing the pistons of steam engines, steam pumps, etc., ring packing stands justly in highest favor. When properly adjusted this packing secures perfect tightness, with less friction than any other packing of equal efficiency.

We this week illustrate an improvement in this kind of packing, having for its object to provide a convenient packing for the split parts of the rings, and also to regulate the elasticity of the rings, making it equal throughout.

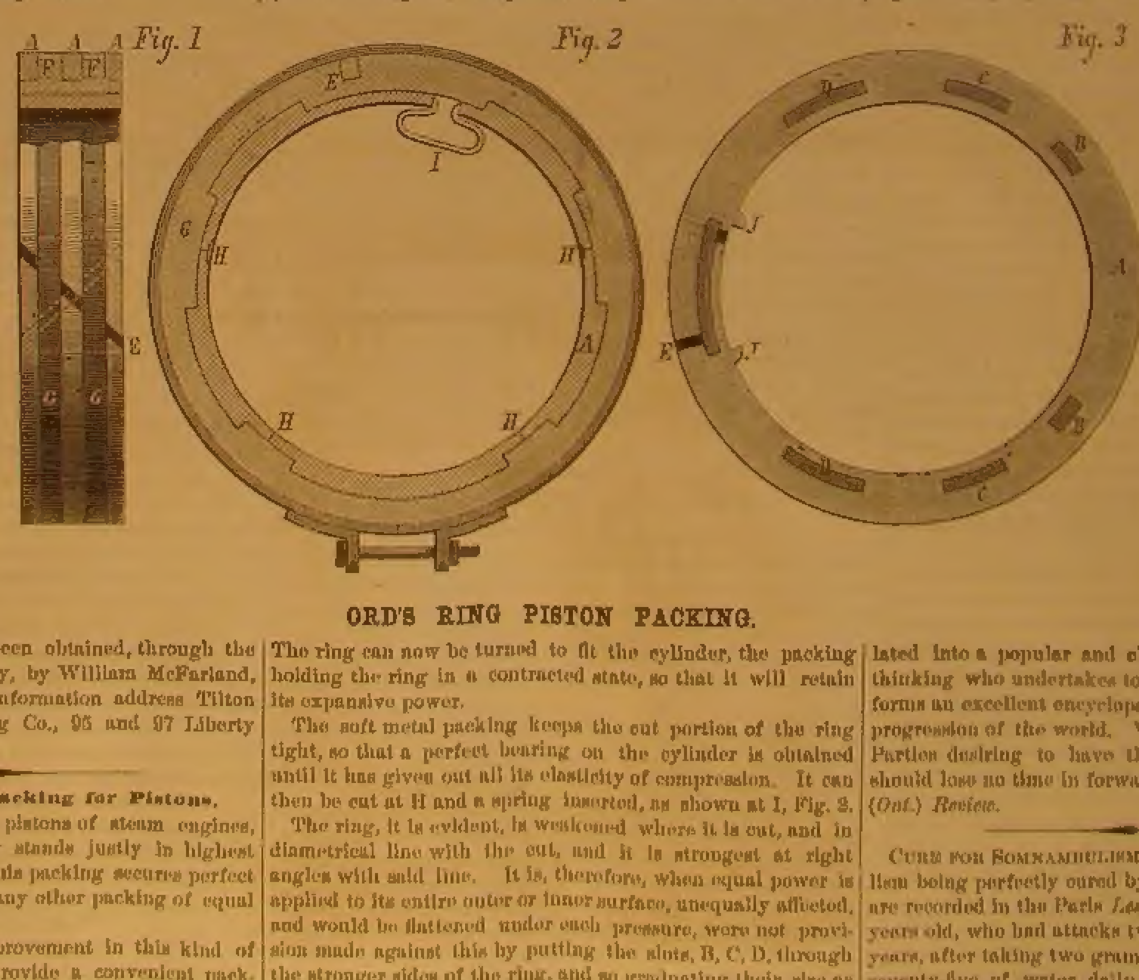
It is claimed that this method possesses the following advantages: First, the ring is complete in a single piece; second, it is self-adjusting; third, a wider range of expansion is secured; and, fourth, it cannot be put in wrong when perfectly made.

We are informed that a number of these rings have been put into practical use, giving entire satisfaction, and that it took the first premium at the late Northern Ohio State Fair. The rings are adapted to cylinders of all dimensions.

The invention consists in so constructing and grooving the ring that it will readily receive a packing of Babbitt or other soft metal, which retains the ring in a compressed state, allowing it to exert its elasticity to produce a tight fit; secondly, in weakening the rings by slots at the sides, so as to thereby equalize the elasticity; and, thirdly, in providing a spring on the inner side of the ring, in case its elasticity should become impaired through wear or otherwise. A in the engravings represents the piston ring. It is made of suitable width and thickness, cast of suitable material, with transverse slots, B, C, D, extending through it from face to face. The ring is cast larger than the cylinder for which it is intended, and is then grooved on the edge, as shown at Fig. 1, the grooves reaching the transverse slots, shown in Fig. 3.

The ring is now cut obliquely near the slot, at E, a piece being taken out as large as will allow compression to the required size. It is then compressed by a bolt and strap, as shown in Fig. 2.

The soft metal packing, G, is cast into the slots, B, C, D, and allowed to branch into the grooves, F, filling them entirely, and holding the compressed ring in a contracted state.



ORD'S RING PISTON PACKING.

The ring can now be turned to fit the cylinder, the packing holding the ring in a contracted state, so that it will retain its expansive power.

The soft metal packing keeps the cut portion of the ring tight, so that a perfect bearing on the cylinder is obtained until it has given out all its elasticity of compression. It can then be cut at H and a spring inserted, as shown at I, Fig. 2.

The ring, it is evident, is weakened where it is cut, and in diametrical line with the cut, and it is strongest at right angles with said line. It is, therefore, when equal power is applied to its entire outer or inner surface, unequally affected, and would be flattened under each pressure, were not provision made against this by putting the slots, B, C, D, through the stronger sides of the ring, and so graduating their size as to equalize the strength of the ring throughout. Ribs, J, Fig. 3, projecting from the inner face of the ring on both sides of the cut receive the spring, for expanding the rings to take up wear, after they have expended their original elasticity. Patented, through the Scientific American Patent Agency, November 15, 1870, by William Ord, whom address for further information, at Brooklyn, Ohio.

Sun Spots.

The first symptom of a spot appearing is a tiny speck upon the photosphere, as the luminous exterior of the sun is called. This goes on enlarging, sometimes quickly through a few hours, sometimes slowly through many days; and as it grows it developes a double character—a black center and a gray penumbral fringe increasing together. There is no order or constancy in the matter of size, but in the matter of form there is noticed a general tendency to rough circularity while a spot is growing; and this shape is preserved, with small variations, until it begins to dissipate. Neither is there any regularity in the period of existence of spots; some will come and go in a day, others will remain in their full grown state for many months. When the time of breaking-up arrives, the boundary becomes irregular, and sometimes a sort of whirlpool action manifests itself, if it has not appeared before; the luminous matter of the photosphere intrudes itself in tongue-like masses into the chasm, and even bridges over it, parts of the penumbral fringe break away, the nucleus divides, and a general wrecking ensues, the *disjecta membra* scattering themselves far and wide, and dissipating as they disperse. The forces concerned in these dislocations must be stupendous indeed; masses of matter, probably thousands of cubic miles in bulk, are hurled over hundreds of miles in a few minutes, sometimes in a few seconds of time. The commotions that tear the solar surface are to the most tremendous earthquakes to which our globe has been subjected as are these last to the turning of the husbandman's sods.

And now to the question: What is a solar spot? Would that we could give it a satisfactory answer! The philosophers are groping for one now, as they were a century ago; but there is this consolation, that they are a century nearer to a solution, and there is hope that they will reach it long before such an interval again expires. An immense stride has been taken through the agency of the new science of spectrum analysis. The prism has shown that light does come from a solar spot, and that it is light of very peculiar character; not of that heterogeneous kind which we receive from the general body of the sun, but of the homogeneous nature which belongs to glowing gases. And in particular has it revealed that the prevailing element [hydrogen] is most conspicuous in the seeming black hole. More than this, by a highly-refined measure of light-motion, which cannot be popularly elucidated in such space as we have at command, it has been shown that there are down-rushings and up-rushings of the gaseous currents within the area of a spot, the very speeds of which have been approximately ascertained. So that toward a reply to our question we have the inference that a solar spot is a crateral opening in the light-giving shell of the sun, through which an interchange of gaseous currents is taking place between the interior of the globe and the atmosphere by which it is surrounded, which atmosphere there is good reason to believe is largely composed of flaming hydrogen gas.

The Scientific American

We are are in regular receipt of this popular and valuable scientific journal, and we know of no publishing house to which we feel more indebted for theoretical and practical scientific information than the enterprising firm of Munn & Co., of New York.

The Scientific American stands without a rival on the American continent, and can justly claim the undisputed rank that its foremost career deserves. It is full of useful and scientific information collated into a popular and elaborate form; it sets every one thinking who undertakes to read any of its able articles, and forms an excellent encyclopædia of the material and scientific progression of the world. We never wish to miss a number. Parties desiring to have their names placed on the books should lose no time in forwarding their orders.—*Peterborough (Ont.) Review.*

Cure for Somnambulism.—Two instances of somnambulism being perfectly cured by means of bromide of potassium are recorded in the Paris *Les Mondes*. A woman twenty-four years old, who had attacks two or three times a week for ten years, after taking two grammes of bromide of potassium in seventy-five of water daily, the dose being gradually increased to six grammes, was entirely cured at the end of two months. In the other case a girl of eight years, after taking one gramme morning and evening for a short time, was completely restored to health.

Self-Oiling Seamless Wagon Skein Box.

The improvement which we herewith place before our readers, consists in providing a way whereby the axles of wagons can be oiled without the trouble and delay of removing the nut and wheel, and also in securing more perfect and uniform lubrication, which, under all ordinary circumstances, prevents the axles from becoming dry, so as to increase friction and wear.

Fig. 1 is a longitudinal section of the axle skein box and nut.

The oil is put in at A, and running down a longitudinal groove, B, made in the upper part of the skein, immediately finds its way to all parts of the bearing surface. As the oil settles to the bottom of the box it runs along and falls into an annular recess, C, formed in the box.

Fig. 2 is a cross section through the recess, C. By reference to this figure it will be seen that the recess, C, contains within it lateral ribs, D. These ribs, during the revolution of the wheel, carry up the oil which runs into the recess, C, and delivers it again to the groove, B, whence it again flows over the entire bearing surface, and so on continually.

The flange nut, E, Fig. 1, prevents the escape of the oil from the outer end of the box, and the inner end of the box fits closely against a shoulder formed on the skein so as to confine the oil and prevent its escape.

Fig 1

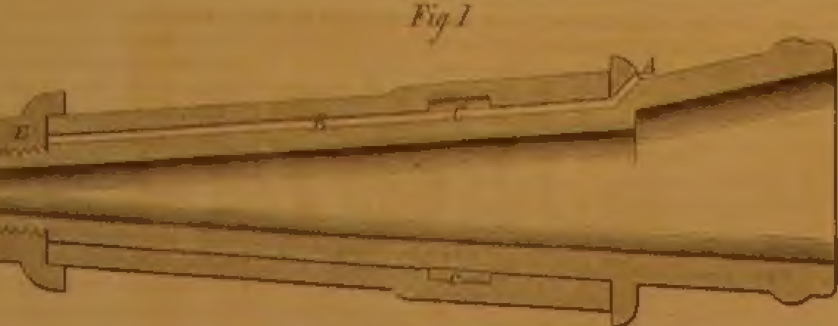


Fig. 2

SMART'S SELF-OILING SEAMLESS WAGON SKEIN BOX.

When the groove, B, becomes clogged, it can readily be cleaned by the use of a wire. Tallow or lard may be used instead of oil, by melting it so that it will flow into the groove, B, through the aperture, A.

Patented, through the Scientific American Patent Agency, Nov. 8, 1870, by Thomas Smart, Jr., of Brockville, Ontario, Canada. For information as to rights, address Elswood Smart, care Pittsburgh Cast Steel Spring Co., Pittsburgh, Pa.

PERPETUAL MOTION.

NUMBER II.

In the library of the British Museum is an edition of "A very necessarie & profitable booke concerning Navigation, compiled in Latin by Joannes Taisnierus, a public professor in Rome, Ferraria, and other universities in Italie of the Mathematicalles, named a Treatise of Continuall Motions; translated into English by Richard Eden." It is a black letter quarto tract, printed by Richard Jugge, without date, consisting of eighty-two pages. The first part is "Of the vertue of the Loadstone," and the second part is "Of continual motion by the said stone Magnes." It was reprinted 1579. In his introductory remarks, he observes, in allusion to continual motion, that it is—

"The thing which to this day in manner from the beginning of the world, great philosophers with perpetual studie and great labour, have endevoured to bring to effect, and desired end, hath neverthelesse hitherto remayned eyther unknowen or hydde, not without great damage & hyndrance of most expert mathematicians. * * * * * * * *

"From the begynnyng of the worlde, in manner all naturall philosophers and mathematitians, with great expences and labour, have attempted to fynde out a continual motion or moovyng; yet unto this day have few or none atteyned to the true ende of their desyre. They have attempted to doo this with divers instrumentes & wheeles, & with quicksylver, not knowyng the vertue of this stone. Neyther can continual motion be founde by anye other meanes, than by the stone Magnes, in this maner. Make a holowe case of sylver, after the fashion of a concave glasse, outwardly laboured with curious art of gravyng, not onely for ornament, but also for lyghtnesse; the lyghter that it is, so much the more easyer shal it be mooved, neyther must it be so pearced through, that such as are ignorant of the hyd secrets, may easyly perceyve it. * * * * * * * * * *

"It must have on the inner syde certayne little nayles & denticles or smal teeth of iron of one equal weyght, to be fastened on the border or margent, so that the one be so further distant from the other, then is the thycknesse of a beane or chich pease. The sayd wheele also must be in all partes of equall weyght, then fasten the exiltree in the myddest, upon the whiche the wheele may turne, the exiltree remaynyng utterly immoveable. To the whiche exiltree agayne shal be joyned a pynne of sylver, fastened to the same, & placed betweene the two cases in the hyghest parte, wherein place the stone Magnes. Beyng thus prepared let it be fyrste brought to a rounde fourme, then (as is sayd) let the poles be founde: then the poles untouched, the two contrarye sydes lying betweene the poles, must be fyled & pullyshed, & the stone brought in manner to the fourme of an egge, & somewhat narrower in those two sydes, lest the lower parte thereof shoulde occupie the inferior place, that it may touche the walles of the case lyke a little wheele. This done, place the stone upon the pynne, as a stone is fastened in a ryng, with such art, that the north pole may a litle inclyne toward the denticles, to the ende that the vertue thereof worke not directly his impression, but with a certayne inclination geve his influence upon the denticles of iron. Every denticle therefore shall come to the north pole, & when by force of the wheele it shal somewhat passe that pole, it shal come to the south part, whiche shall dryve it back agayne, whom then agayne the pole artike shall drawe as appeareth. And that the wheele may the sooner doo his office within the cases, inclose therein a litle calculus (that is) a litle rounde stone or pellet of copper or sylver, of suche quantitie, that it may commodiously be receyved within any of the denticles: then when the wheeles shal be raysed up, the pellet or rounde weyght shal fal on the contrary parte. And whereas the motion of the wheele downwarde to the lowest part, is perpetuall, & the fal of the pellet, opposite or contrary, ever receyved within any two of the denticles, the motion shall be perpetuall, because the weyght of the wheele & pellet ever enclyneth to the centre of the earth & lowest place. Therefore when it shal permit the denticles to rest about the stone, then shal it well serve to the purpose. The myddle places within the denticles ought so artificially to be made belowe, that they may aptly receive the fallyng pellet or plommet, as the fygure above declareth. And briefly to have wrytten thus much of continual motion may suffice.

"Description of the Engraving, Fig. 3.—A, the stone; B, the sylver pinne; E, calculus, a little rounde stone or small weyght."

Notwithstanding our author of the 15th century seems so satisfied with his invention, we find that two centuries later the world was still without the desired self-mover, for Jacob Leupold, in a work published at Leipsic in 1724, says:

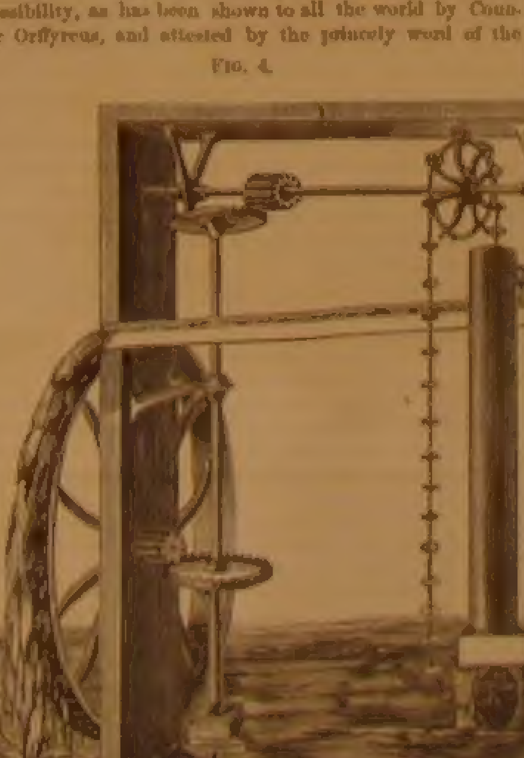
"It still remains to find out this wonderful and undiscovered thing, which to the present time remains impossible both mathematically and mechanically, so far as we yet know. Great weight only increases friction, but there was a wheel

FIG. 3

or machine that did not weigh above forty pounds, and was nine feet diameter, which promised better results, yet failed like others, and so dissipated all hope of succeeding.

"Notwithstanding we hold that perpetual motion is not an impossibility, as has been shown to all the world by Councillor Orffyreus, and attested by the princely word of the

FIG. 4.



Landgrave of Hesse Cassel, a prince himself well grounded in the science of mechanics, and who so minutely scrutinized and observed this wonderful motion, which was with him on trial during two months; all of which time he kept the machine in a sealed chamber."

"To all the seekers after perpetual motion the following remarks will be found most valuable:

"1. That they must endeavour to construct one of the simplest of machines; for the more material and workmanship, the less chance of durability. And if not found in such simple arrangement, it will be hid for ever.

"2. That it must be tried by experiment and not only on paper, for the friction and action can only be estimated by trial.

"3. That unless grounded in the fundamental principles of mechanics, no one should attempt the project, as he will only lose time and money. The thousands who fail of success yet learn something of mechanics, and that one pound cannot move more than one pound, but always arrives at an equilibrium."

In a work entitled A History of the Manual Arts, we find the following:

"Archimedes, of Syracuse, the greatest mathematician and the rarest engineer that was in his time, invented a sphear and an artificial heaven, wherein he did represent the rotations and revolutions of the planets," and of which Claudian gives a poetic description—"that this machin did move of itself; it was an automaton, a self-moving device;" and further, "that these motions were driven and acted by certain spirits pent within;" also of another device of "a silver heaven sent by the Emperour Ferdinand for a present to Soliman the Grand Signior," with twelve men, and a book "that shewed the use of it, and how to order and keep it in perpetual motion." An account is next given of Cornelius van Drebble, a Dutchman, of Alcmar, engineer to King James, in England:

"He presented the king with a rare instrument of perpetual motion, without the means of steel, springs, or weights; it was made in the form of a globe, in the hollow whereof were wheels of brass moving about, with two pointers on each side thereof, to proportion and show forth the times of dayes, moneths, and years, like a perpetual almanack."

The accompanying engraving, Fig. 4, is taken from a work by Robert Fludd, published in 1618.

It is a water wheel which is expected through a system of gearing to operate a chain pump, which pump should raise the water necessary to propel the wheel, and so on forever. It is probably unnecessary to inform our readers that this fallacious principle has been tried in various ways, and that there are occasionally yet to be found those so unskilled in mechanical science, and incapable of seeing the radical error of the device, as to waste their substance in a repetition of this time honored blunder. We have now in mind an instance in point, in which a man spent the accumulation of an industrious life in endeavoring through various makeshifts to get such a wheel to move, and who has brought poverty upon his declining years, through his absurd experiments. It was earnestly sought by his friends to convince him that nothing in falling could perform more work than that required to raise it to the point from which it is allowed to descend, but all such efforts proved vain, and our perpetual motion seeker would not desist till he had sunk his bottom dollar. "*Perseverantia vincit omnia*," was his reply to every argument and appeal, a motto which perhaps is true when applied to possibilities, and the failure of which in all the attempts to secure a self-mover only strengthens the belief in the impossibility of the thing sought.

We not unfrequently have letters of inquiry if such a plan is not feasible, and if the discovery is not patentable, even at this late day.

Operations of the Postoffice.

The report of Postmaster-General Creswell is a very instructive document and worthy of careful perusal. The ordinary revenues of the Department for the fiscal year ended June 30, 1870, were $19,772,220 65, and the expenditures of all kinds, $23,998,837 63. For the year ended June 30, 1869, the ordinary revenues were $18,344,510 72, and the expenditures, $23,698,131 50. The increase of revenue for the year 1870, over the year 1869, was $1,427,709 93, or 7·78 per cent, and the increase of expenditures, $300,706 13, or 1·32 per cent, showing a net increase in revenue of $1,127,003 80.

[illegible]

During the past year, 3,071 cases of loss by mail depredations, of which 1,574 were of registered letters, were reported to the Department, involving losses in bonds, drafts, and money to the amount of $1,393,768 21, a considerable portion of which has been recovered. The number of arrests for violations of the postal laws was 143, and the number of convictions of those who were brought to trial 54, the remainder being released on bail, acquitted, or held for trial. The Department is constantly availing itself of all the means within its reach to give perfect security to the mails, and to bring to justice any of its employés who yield to the temptation to violate the trust reposed in them.

THE POSTAL ORDERS SYSTEM

is on the increase and affords almost absolute protection against loss of money through the mails. The magnitude of the operations of the money-order system is well illustrated by the statement that, at the city of New York alone the orders issued during the last year amounted to $630,258 80; the orders paid, to $3,871,516 11; the remittances received

from postmasters, to $5,987,899; and the drafts of postmasters paid, to $1,430,381.

The loss of these registered packages containing remittances of surplus money-order funds causes no detriment whatever, either to the remitters or to the payees of money-orders. It is the Department and not the public, that suffers the loss resulting from the failure of such remittances to reach their destination. It will be observed that losses of this nature form a considerable item in the annual expenses of the money-order system, although the total of such losses, $8,160 50, is very small in comparison with the whole amount of money remitted for deposits during the year, viz.: $23,246,027 70.

Out of 1,075,228 domestic money orders paid during the year, it was claimed that payment of 19, of the aggregate amount of $587 64, was fradulently procured through forgery of the payee's signature, or by false pretenses. After a full investigation, the paying postmasters, in six of these cases, having been found at fault, were directed to pay to the proper owners, respectively, the amounts of the several orders, the total of which was $204. In seven cases, amounting to $178 50, the paying postmasters were not considered as justly responsible for the improper payment, and the Department paid that amount to the true payees. The remaining six cases, amounting to $159 14, are held for examination and report by special agents.

HOW THINGS PROGRESS.

Postmaster Creswell denounces the franking privilege, and refers to the wonderfully rapid expansion of the postal system as strikingly displaying the wonderful growth of the United States in population and wealth. Among other illustrations of this kind he refers to the fact that during the first year of President Washington's administration the number of letters transmitted in the mails did not probably exceed 300,000, and the annual transportation was about 350,000 miles. During the first year of the present administration, the number of letters carried in the mails could not have been less than 550,000,000, to say nothing of the immense amount of printed matter; and the aggregate of distances traveled amounted to 97,024,998 miles. These comparisons are sufficient to exhibit the great advance which the United States has made in the short space of eighty years. The results are so astounding that it seems impossible even at this day to predict the development to which our country will attain at the close of the present century, of which only thirty years remain.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Effect of Artillery Discharges on the Weather.

MESSRS. EDITORS:—The article of E. W. Brown, of Cambridge, Ill., brings to mind what I proposed to do on the breaking out of the late war between the States. I left for Washington, May 1, 1861, and in New York city I met a friend quite well known for his scientific and literary attainments. I said to him that my object was to go with the army as a meteorological observer, as I had for several years made observations for the Smithsonian Institute. On my arrival at the National Capitol, I laid my plans before one whom I believed of all others was likely to approve of them, as he had been a close investigator of the science of meteorology; but from him, or any other, I could get no encouragement. I think I have good cause to remember the terrible storms following the first battles, Bull Run, Fair Oaks, Malvern Hill, and several others, that were followed by storms. When Burnside was "stuck in the mud," and when the terrible storm, commencing in the far West, swept over the whole country, and struck his army when it was well under way, the terrible suffering of that march could have been avoided by a proper system of observations. I now have before me three letters, from the headquarters of as many commanders, declining my services, proffered without hope of reward except my rations. I believe I know why my plan was given the cold shoulder by the man of science in Washington. He cared more for a cause than he did for humanity. I hope to yet see a compilation of the observations made during our war on this subject, and I also hope that the governments of Europe now at war will not lose sight of so important a subject.

E. A. DAYTON.

Richmond, Va.

Remedy for Ivy Poisoning.

MESSRS. EDITORS:—The experience of several of your subscribers, in reference to the plant called poison ivy, has interested me, and I herewith give my experience.

About the middle of last September, my arms became badly poisoned as I was gathering some fruit that had fallen among a thrifty growth of that venomous weed. As I was very careful not to bruise the plant, I had little fear of poisoning; but I counted without "mine host." Two or three days served to tell me that I had not escaped its baneful influence. I first tried sweet oil, to allay the burning irritation; then I used salt and water, and afterwards strong lye, made from wood ashes. All these seemed to increase the effect of the poison. A friend recommended three or four drops of the medicinal remedy known as *Rhus toxicodendron*, to be drank twice a day, in half a glass of water; this failed. Another friend proposed a wash made from a solution of belladonna, say a teaspoonful to a tumbler full of water, and this was tried with signal success. With this solution I bathed my arms, and two or three applications showed a decrease of the swelling, and a freedom from the irritation and burning.

As the leaves of the poison nightshade cannot always be obtained, an efficient remedy may always be at hand in the form of its extract, known as belladonna.

New York city. W. B. HARRIS.

Central Shaft of Hoosac Tunnel.

MESSRS. EDITORS:—I read in your excellent journal of October 29th, an article concerning the Hoosac tunnel's central shaft. You, very judiciously, observe that in giving the shaft such a direction as would bring it in the center of the tunnel, "it is quite possible the motion of the earth may affect the plummet, more or less." Experiments made with the greatest care, in Paris, some years ago, under the dome of the Pantheon, leave no doubt on that point.

The plummet string employed in that experiment had a length of about one hundred feet, if I remember well. It demonstrated clearly, by its large deviation, the rotation of the earth, which was the object of the experiment. Consequently, it is proved that it is impossible to obtain a perfect perpendicular line by means of a plummet, and that its deviation to the West will necessarily be increased with the depth of the shaft, in a geometrical progression.

I believe that a reliable result can only be obtained by the aid of a transit instrument, modified according to the exigencies of position, and of surrounding circumstances.

PAUL D'HERBRY, A. M., M. D.

San Jose, Cal.

A Home for the Aged.

MESSRS. EDITORS:—I herewith send you a list of a few of our citizens, showing the longevity of people in this place:

Age.	Name.	Nativity.
90	David Wright	Vermont.
90	John J. Wever	Germany.
92	Mary Lyons	Ireland.
91	Mary Allen	Connecticut.
92	Elizabeth Bennet	Pennsylvania.
92	Mary Fulton	"
92	Elijah Adams	"
93	J. K. McElroy	Ireland.
94	John Roloson	New Jersey.
90	Rodham Graves	Virginia.
99	William Jenkins	Ohio.

Now, sirs, from this kind of stock has sprung the "fair women, brave men, and beautiful children" that abound in this part of the country. This is truly a good place to live in.

H. BESSE, M.D.

Delaware, Ohio.

Railroad Speed.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN, of Nov. 26, you give the average speed of the *Limited Mail* from London to Holyhead, at from 40 to 45 miles per hour, and quote that as the extreme speed of railway traveling.

At this moment I cannot say what is the actual speed of the *Limited Mail*, but I believe it is nearly 60 miles per hour.

There are two trains each way daily between London and Brighton, running the distance—nearly 60 miles—in sixty minutes. There are three trains each way between London and Grantham, doing the 106 miles in two hours. Thirty-three minutes is the time allowed for fast trains from Hitchin to London—distance 32 miles.

I have made many journeys between the above-named places in the time I have given. A. O. T.

[We have ridden on all the principal English railways, and the only time we remember ever to have gone at the rate of a mile a minute was on the express train from Glasgow to Liverpool, and for a short time only on a down grade. Whenever it came to the locomotive drawing the train, the speed was much reduced.—EDS.

Poisonous Fertilizers.

MESSRS. EDITORS:—On page 129, current volume, of the SCIENTIFIC AMERICAN, you gave directions for making bone fertilizers, in which it is recommended to dissolve the bones in oil of vitriol. Common oil of vitriol is, as far as I know, the substance used by all manufacturers; but I think none but the chemically pure acid should be used. The common acid often contains a small quantity of lead and arsenic, both of which are known to be absorbed by plants when presented to their roots.

Dr. Edmund Davy, Professor of Agriculture and Agricultural Chemistry, in the Royal Dublin Society, published a paper, in 1859, calling attention to the danger of using manures containing arsenic; yet there has not up to the present time, I believe, been a pure article of superphosphate of lime put in the market. I think the use, for the purpose mentioned, of acid containing arsenic or lead ought to be prohibited by law.

Charlotte, Me. H. A. S.

Why Mainsprings Break.

MESSRS. EDITORS:—I see by your paper that the cause of watch springs breaking is considered mysterious. Perhaps I can, to some extent, solve this mystery. When the mainspring is taken out in cleaning a watch, and is handled by the watchmaker, it expands in consequence of the warmth of his hands. Upon putting it in the watch, and putting the watch together, the watchmaker usually (if the watch runs free) winds it up to its full power, the spring is then, of course, in its expanded condition, wound close around the arbor; upon cooling it naturally contracts, and, of course, being already tight, something must give, and the spring breaks. My experience has taught me that it is unwise to wind a watch all the way up immediately after cleaning or putting in a spring. If a watchmaker will take the trouble to inquire, when a watch comes in with a broken spring, how long it ran after winding, he will find that it is almost invariably from two to four hours, showing that winding has something to do with the result. Any one who wishes to test the truth of the above can do so by heating a piece of mainspring, and fastening it at full length rigidly at both ends, and then letting it cool. It will almost certainly break if the experiment is well performed.

Camden, N. J. HENRY HOLLINSHEAD, JR.

Beams, Girders, Bridges.

MESSRS. EDITORS:—Your quotation from the *Builder* on page 320, and the criticisms upon it by H. C. Pearson, on page 307, current Vol., SCIENTIFIC AMERICAN, indicate a wide difference of opinion between the *Builder* and Mr. Pearson on the question of beams, etc.

The *Builder* is unquestionably wrong in saying that "girders are acted on by weights placed on them at stated places, inversely as the squares of the distances of such places to the supports." It should be inversely as the distances, and not as the squares of the distances. The error appears to have arisen from applying to concentrated weights or loads the formula applicable to loads uniformly diffused over the entire length of beams, which is the way in which loads are usually supposed to be applied to beams, girders, and bridges. Under loads thus uniformly applied the strains increase as the squares of the spans.

The positive statement of Mr. Pearson, that "a beam ten times the length of another, of the same size in other respects, has one tenth the strength of the shorter one," appears to be equally erroneous. Take, for instance, a beam of ten feet in length, ten inches depth, of the most approved form, and so proportioned as to make it bear safely a load of 10,000 pounds. Then take a beam of 100 feet in length, having in all other respects the same form and proportions as the first, and see whether it will sustain 1,000 pounds—one tenth part of the load of the first beam. According to the theory of Mr. Pearson, which he claims to be approved by all educated engineers in Christendom, it will. But even the most unlearned mechanic who is accustomed to handle beams knows better. So far from such a beam bearing 1,000 pounds, it cannot sustain its own weight. Mr. Pearson's error in this instance appears to consist mainly in substituting strength of the beam for the strain due to the load, and in not considering the weight of the beam, which in itself forms an element of the first importance in calculations of this kind, especially when the length of the beam greatly exceeds its depth.

BENJAMIN SEVERSON, Mechanical and Civil Engineer.

Washington, D. C.

How to Prove a Millstone Level.

MESSRS. EDITORS:—First level the bed stone and tram the spindle in the usual way. Now, to prove the operation correct, put the running stone on the spindle, raise it clear off the bed stone, say, one-fourth of an inch, and put the stone in motion up to the usual speed; after it has acquired a uniform motion, commence letting it down until it touches the bed stone. To see that all is right, look between the stones while you are lowering the runner; if the stone is level, there will be no need of letting them come together; if not, there will be no harm done, for it will merely tick and let you know which is the highest side.

To correct any stone not level, find out which is the high side while the stone is running, then raise the lowest side of the bed stone until the runner will tick on all sides alike. Another way to make the stones come evenly together is to move the bottom of the spindle *from* the lowest side of the bed stone. I have seen new mills where the husk was so weak you could not level your stone in any other way, and I have seen stones that were condemned made to grind well by this operation. N. H. ELLIS.

To Telegraph Learners.

MESSRS. EDITORS:—I would be glad to give my experience to learners, as it so nearly compares with the article in the SCIENTIFIC AMERICAN of November 19th. Two of us learned the alphabet by writing to each other, using the telegraph alphabet in our correspondence. I was always drumming with my forefinger, and now, though out of practice, often find myself writing sentences with my forefinger. When first learning, I was often found drumming on the head-board of the bed, while in my sleep. A brother operator of mine and myself have often amused a company at the table by talking to each other with our knives or forks. A very simple key can be made for practice, of wood and a few screws, by any ingenious boy, that has ever seen one in an office, or picture of one. I made a key and sounder, and procured materials for a battery. The cost of the wire, bent iron for magnet, porous cup, and all, did not exceed one dollar, and I had a set of instruments to practice with. O. F. GOODALE.

Martinsburgh, N. Y.

Bee Stings Again.

MESSRS. EDITORS:—On page 298 of the last SCIENTIFIC AMERICAN, under the head of "Bee Stings," you say, "No outward application can have any effect in curing the sting of a bee." From this I beg leave to differ. I claim that any substance that is a good absorbent will "draw" a part of the poison, and thereby ease the pain and reduce the swelling. To rub the poison into the circulation may do well enough for a single sting; but we occasionally read of persons receiving so many stings as to produce death if the poison is not extracted. The best absorbing substance that I have tried is lean fresh meat. This will relieve the pain of a wasp sting almost instantly, and has been recommended for the cure of rattlesnake bites. I have also used it with marked effect in erysipelas. HENRY A. SPRAGUE.

Charlotte, Me.

THE Hon. Isaiah Blood, State Senator from the XVth District, died at his residence in Ballston Spa, Saratoga county, on Tuesday night, at the age of 63. He had suffered greatly during a long attack of typhoid fever, and his death has been hourly expected for several weeks. He was the proprietor of extensive ax and scythe manufacturing works in Ballston Spa, and had accumulated a large fortune.

Something about Bread-Making.

A subject that interests everybody is that of bread-making, and as a general thing, there is too much popular ignorance respecting it. In the process of grinding wheat for superfine flour, the outer shell, composed chiefly of gluten, being tenacious and adhesive, comes from the mill in flakes with the bran, and is sifted out, while the starch is pulverized and constitutes the fine flour. Thus the starch, which is the chief element in fine flour, is saved, which contains no food for brain and muscle; and the gluten, containing phosphates and nitrates which furnish support for brain, bone, and muscle, is cast away with the bran, and is fed to horses, cattle, and pigs. And this is the kind of flour that makes nine tenths of the bread in American cities, besides all that is used in cakes, puddings, and pastry.

A method of making bread from whole wheat, without previously grinding it into flour, has been devised by a Frenchman named Sezille. The grain is first soaked in water for half an hour; then put into a revolving cylinder with a rough inside surface, and shaken up, so as to remove the coarser part of the skin; and then soaked twenty or twenty-four hours more in water of the temperature of 75 degrees Fahrenheit, with which a little yeast and glucose has been mingled. By these means the grain acquires a pasty, doughy consistence, and can be mixed up by machinery and made into bread in the usual way. The invention is an important one, both from its saving the expense of grinding, and from the greater economy of keeping and transporting the whole grain instead of flour.

A HEALTHY BREAD.

The most economical and best bread, especially in cold weather, when a hot fire is constantly kept, is what is sometimes called gems, or unleavened biscuit. For this purpose a group of cast-iron pans or cups 2½ by 3½ inches each, all made in one casting, is used. These pans are set on the top of a hot stove and allowed to become almost smoking hot when buttered for use. Then with cold water and milk, half-and-half, or with cold water alone, and the colder the better, mix and stir quickly with a stiff spoon as much Graham or unbolted wheat-meal as will make a stiff batter or thinnish mush; and when the pans are hot, fill them quickly with the thin dough and let them stand a minute on the stove before putting into a very hot oven, where they should remain twenty or twenty-five minutes, until done. If the mixture be neither too thin nor too stiff, and the pans and the oven be hot, you will have twelve as light and wholesome biscuits as any epicure could wish to eat. They may be eaten smoking warm from the oven, as they contain no poisonous chemical elements like yeast bread, which requires cooling to be rid of. They are good cold, or may be warmed in a steam-kettle. Anybody, however unskilled in cooking, can learn to make these light and nice every time. Nice, fresh wheat-meal, very cold wetting, quickly done, with a very hot place to bake them, will insure the best of "luck" always. These, like all other Graham bread, should be fresh every day.

For growing children, and those people who work or think, and especially students and sedentary persons, there is no other bread, and scarcely any other single article of food, that equals it. Let the poor who cannot afford to lose 14 per cent of the grain in the cast-off bran; let those whose bones and muscles are small, tending to rickets and spinal curvature; let invalids and dyspeptics try it, and they never will go back to superfine bread simply because it looks white and nice, and, when dry, is more pleasant to the mouth than the brown.

Imitation Pearls.

There is no end to the variety of substances which inventive art has at its disposal in creating objects of use and beauty. From the sand upon the seashore, to the moss that grows upon the mountain top, it ranges with ever fresh devices, and with continual success. Moreover, when the real articles of use or adornment cannot be found, it has a thousand ways of replacing them, by means of other combinations. In fact, this business of imitation is one of the most interesting branches of industry, and were we to pursue its investigation, we should find a volume grow upon our hands. We can, therefore, take up but one point of it at a time, and the special one that we have chosen for to-day relates to the manufacture of pearls.

When we read glowing descriptions of the pearl, its wondrous beauty and its great value—the pride of Cleopatra and of the Oriental kings,—we are a little staggered at first, as we hear the assertion that a jewel so rare can be imitated to perfection. Yet, at the London Crystal Palace, in 1862, a French jeweler exhibited in his show-case alternate rows of huge pearls—the real and the imitation articles, side by side—and above them was a placard with the inscription: "Which of these are the artificial?" No one from merely looking at them could tell; and even the best experts were deceived. As nearly as can be ascertained, the first artificial pearls were made in the thirteenth century, judging by the code of rules adopted for the Guild of Goldsmiths in Paris, in the year 1260; but Hardwicke, an authority in such matters, thinks that the imitations then produced were simply opalescent beads of glass, like those still made of different colors, and known as *perles a la lune*.

About the middle of the seventeenth century, the mode of making artificial pearls, by coating little globules of glass on the outside, with a varnish prepared from the scales of a peculiar kind of fish, was discovered and practiced with great success. In 1691 there was a book published in Paris, called the *Livre des Addresses*, or, in plain words, the "Directory," as we would call it in our day. The manufacture of pearls above hinted, was mentioned in that book as a new invention, and the articles were said to be so natural as to defy detection. Jaquin, a rosary maker, gets the credit of the discovery. At that time, these artificials were coated on the outside; now, the coating is put upon the inside, and the process may be described as follows: A number of hollow beads, or thin, transparent glass, are blown with a lamp, and a drop of "pearl-essence," so called, is blown into it, and spread about by rolling the beads. This pearl-essence is obtained by scraping off the scales of the bleak, or *Cyprinus Alburnus*, a fresh-water fish, and repeatedly washing them in pure water, until the whole of the foreign and animal matter is removed. To these, after they have been thoroughly washed, a little quantity of the solution of sal ammoniac is added to prevent putrefaction, and then the preparation is ready for use. In employing it, however, the addition of a little isinglass will cause the varnish to adhere well, and minute traces of carmine, saffron, or Prussian or Paris blue may be thrown into so as to communicate a reddish, yellowish, or bluish tinge, in imitation of the same shades as they may be noticed in fine pearls. The essence thus described has become a regular article of trade, and is chiefly prepared for the French and German manufacturers, at Eberbach, on the Neckar river, in Germany. In old times, the pearl makers had to buy the fish and prepare the essence themselves. About seven pounds of fish scales will yield one pound of the genuine moist pearl-essence, and to furnish these would require 20,000 fish.

The famous English white-bait, hitherto chiefly celebrated for its service at aldermanic dinners and friendly frolics at Richmond, on the Thames, are now said to furnish better scales for the "essence" than the bleak do. The scales of the roach and dace are, also, said to be good for inferior artificials. At one time, says an article in the London *Technologist*, on "Mock Pearls," there was a large trade in the commodity, when necklaces were greatly worn in England, and fish scales were in such demand, that from one to five guineas a quart were paid for them. Mahood, the British manufacturer, has made thousands of beautiful and durable [illegible] out of this once totally neglected refuse of the fish. Scale brooches, bracelets, pins, ear-rings, etc., etc., are well known, and can be purchased everywhere. The strong, clear scales of the *corvina* fish—the *Sparus Chilensis*—are excellent for the purpose indicated. So are the golden scales of the king-fish, the *callipeva*, and the large ones of the *pirarucu* fish of Brazil.

The manufacture of artificial pearls is, certainly, one of the most curious applications of what was long considered the merest waste, to the production of exquisite and beautiful things, that even our age of artistic, chemical, and mechanical marvels presents.—*Journal of Commerce.*

The Aurora and the English Telegraphs.

Mr. Culley, Engineer of Telegraphs, writes to the London *Times*:

"As public attention has been directed to the effect of the aurora on the telegraphs, perhaps you will permit one who has been connected with the telegraph from the very first to explain in what manner the transmission of messages is interfered with, and what means are used to keep up the communication.

"The aurora is supposed to be caused by a flow of electricity through the atmosphere at a very great hight, where the air is extremely rare.

"It is, in fact, a kind of lightning, differing from ordinary lightning in being a gentle and gradual flow instead of a violent and sudden discharge.

"The same cause which produces the aurora produces also currents which flow from one part of the earth's surface to another; and, as a telegraphic wire is always connected to the earth at each end, a portion of these currents must necessarily pass through the wire from one station to the other, provided the two stations happen to lie in their course, which is usually, though not always, nearly east and west.

"These so-called 'earth currents' are frequently very powerful (they were specially so, as might have been expected, during the late brilliant displays), but what is more troublesome still, they constantly vary in strength, and also in direction, and, consequently, make it impossible to read a message.

"They also affect the mariners' compass, but not sufficiently to be visible, except under special arrangements. They were powerful enough, however, on Tuesday evening, to deflect the magnet of a Thomson galvanometer, which is really a compass needle very delicately suspended, as much as 200 divisions when it was not connected to any wire whatever.

"It will be obvious, from what has been said, that some telegraph wires are more disturbed than others. Those running nearly east and west suffer most. It will also be readily seen that if the connection with the earth can be dispensed with the currents will not enter the wires.

"When there are several wires available between the two stations the earth connections are cut and the wires are looped, so as to use one of each pair as a return wire in place of the earth, thus forming a complete metallic circuit. But, although this plan is effective, it will be seen that it enables us to use only one half of the instruments affected. At the central office, on Tuesday, we were obliged to loop fifty wires in this manner, losing at once twenty-five circuits.

"We can also connect two wires so as to throw the terminal stations out of the line of disturbance, but, as the direction of the earth current is seldom constant, this method does not give very good results.

"It is also possible in some cases to divide the wire at both ends, introducing a condenser, or very large Leyden jar, and signaling by inductive discharges. This answers perfectly for a cable, but has not at present been found effective for land wires.

"It has been said that the "Northern Lights" have only recently affected the instruments to any serious extent, and this because insulation is not now as well attended to as some years since. Permit me to say that this is a misconception; the effect of the earth current is in many cases the greatest in the best insulated line. The Atlantic Cables, whose insulation is absolutely perfect, are more disturbed than any land line, and are always worked either by the loop or the Leyden jar arrangement."

History and Nature of Alcohol.

The intoxicating quality of wine was known in the time of the patriarchs; but although the early Egyptians were acquainted with fermented barley wort, it is only within the history of the present generation that the properties of the active principle in the wine and wort have been clearly ascertained.

The alchemists of Arabia invented the still, and it appears that one Abucasis was the first person who separated the crude spirit by distillation from wine. He it was who gave it the name of "alcohol," the meaning of which is to paint. This term was probably used because spirit will dissolve certain colors and resins and render them fluid, which water will not.

Raymond Lully, a chemist of the thirteenth century, found that alcohol, produced by the ordinary process, contained one half water, and he has the credit of being the real discoverer of spirits of wine. Still, Lowitz, a German chemist of our day, was the first to prepare real alcohol. Alcohol is so cohesive with water that it is only with the greatest chemical skill that the least portion of water combined with it can be separated.

There are only two methods of forming this extraordinary body: the one by fermentation of saccharine fluids, which has been known from time immemorial; the other (a recent discovery) by forcing olefiant gas through sulphuric acid. It was Hannel who made the last discovery; and although nothing of importance has yet resulted from it, yet we may confidently look forward to great advantages. Hannel, and more recently Berthelot, have shown that alcohol can be produced from coal. By the fermentation process it is known that alcohol is derived from starch, being converted first into sugar, then into glucose, then into alcohol. The Mahomedans, Hindoos, and Chinese abstain from alcohol on religious principles.

Alcohol is a transparent fluid. It has never been congealed or rendered solid by cold. It is considerably lighter than water, as about 79 is to 100. It burns with almost colorless flames, and leaves no trace of residue. Alcohol, when free from water, will boil at a temperature equal to a hot day in summer—80 deg. F. It expands immensely with little heat, hence it is used in the thermometer to measure the increase and decrease of heat. Alcohol dissolves resins, attars, ethers, alkaloids, and numerous other bodies; hence it is of immense service in the arts and manufactures. Many trades would cease without alcohol, it being an essential ingredient in many things; we therefore could not dispense with it.—*S. Piesse.*

The Amazon.

This great river rises in the little Peruvian lake of Lauricocha, just below the limits of perpetual snow. For 500 miles it flows swiftly through a deep valley, then, turning sharply eastward, it runs 2,500 miles across the great equatorial plains. Two thousand miles above its mouth, its width is a mile and a half, increasing to over ten miles at the head of the delta, where it divides, and, after running 400 miles, presents a front of 150 miles upon the ocean. For a great distance, it is bordered by side channels, or bayous, as they are called upon the Mississippi, named by the Indians igarapes, or canoe paths. From Santarem, the principal town above Para, one may paddle a thousand miles, parallel to the river, without once entering the stream. For twenty-five degrees of latitude, every river that flows down the Eastern slope of the Andes is an affluent of the Amazon. It is as though all the rivers from Mexico to Oregon united their waters in the Mississippi. A half-score of these tributaries are larger—the Danube excepted—than any European river out of Russia. The volume of its waters is greater even than the breadth of the river would indicate. At Nauta, 2,200 miles from its mouth, the depth is forty feet, increasing rapidly as it approaches the ocean. The largest ocean steamer could doubtless steam 2,000 miles up the Amazon.

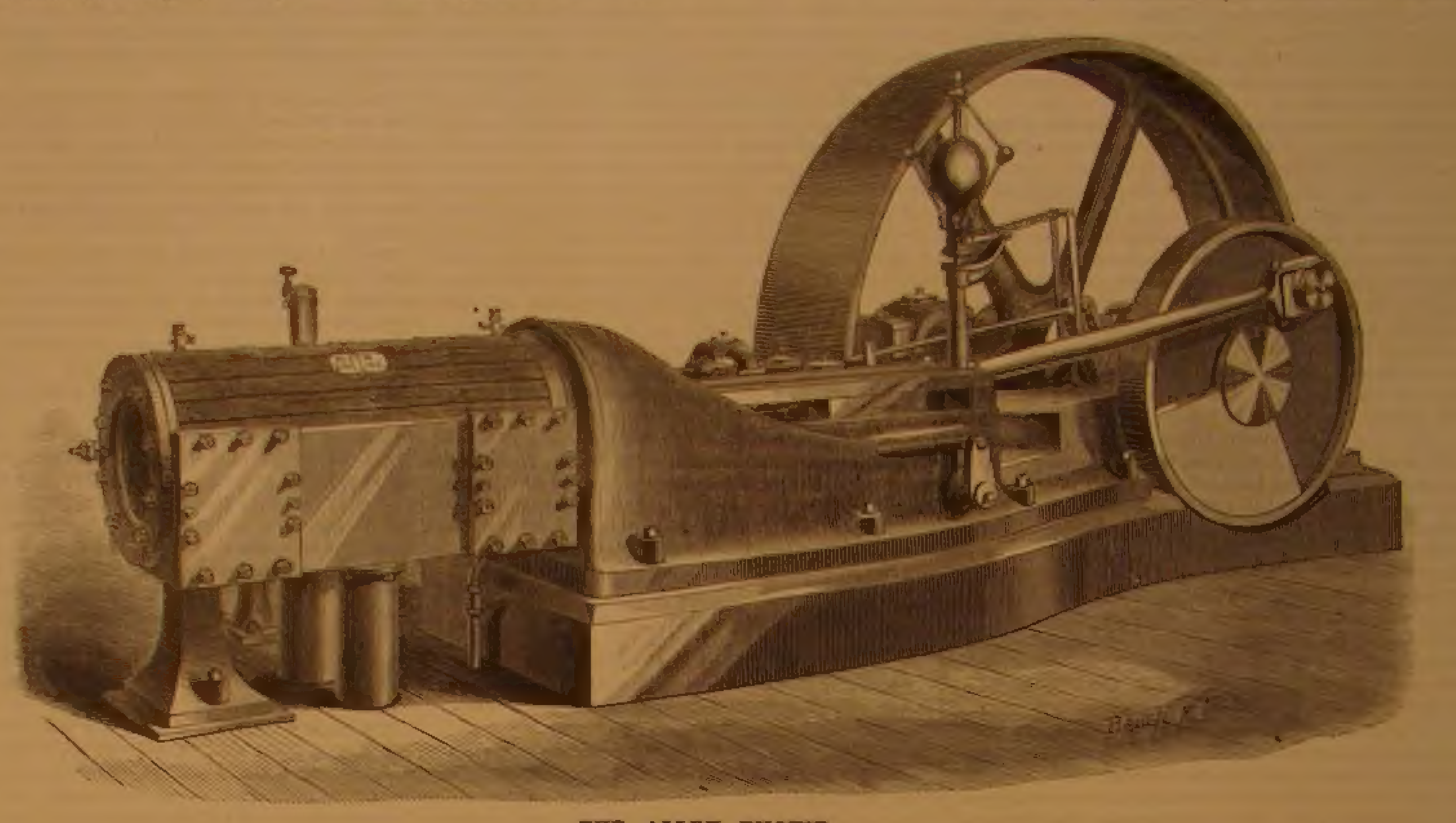
The vegetation of the valley is exuberant. There is a bewildering diversity of grand and beautiful trees, a wild, unconquered race of vegetable giants, draped and festooned by creeping plants. The moment you land upon the shore you are confronted by a solid wall of vegetation, through which, if you wish to proceed, you must hew your way with axe or macheta. Palms, of which thirty variety are noted, constitute the majority of trees. Then there are "cow trees," a hundred and fifty feet high, yielding a milk of the consistency of cream, used for tea, coffee, and custards. The "caucho," or rubber tree, though of a different species from that of the East Indies, produces a gum which constitutes most of the rubber of commerce. Agassiz puts this tree, forty or eighty feet high, in the same class with the milkweed of our American pastures. Of ornamental wood there is no end. Foremost among these is the moira-pinima, or tortoise-shell wood, the most beautiful in grain and color in the world. Enough of this is wasted every year to veneer all the dwellings of the civilized world. For many years to come, the exports of the Amazon Valley must be mainly the products of its forests. Yet, strangely enough, timber is now one of the chief articles of import at Para. A city of 35,000 inhabitants, lying on the verge of a great forest, buys pine boards from faraway Maine. This folly will in time come to an end. Contrary to all that we might expect, the climate of the Amazon Valley is temperate rather than tropical. It is more equal than in any other region of the world.

The Allen Engine.

We present, in the annexed illustrations, a perspective view and a horizontal section, through the cylinder and valve chambers, of the Allen engine—the latest candidate for public favor in the department of steam engines.

This engine was brought prominently into notice at the recent Fair of the American Institute, where two engines were exhibited, running at a rapid speed and giving motion to all the machinery on exhibition, and were doubtless seen and admired by many of our readers.

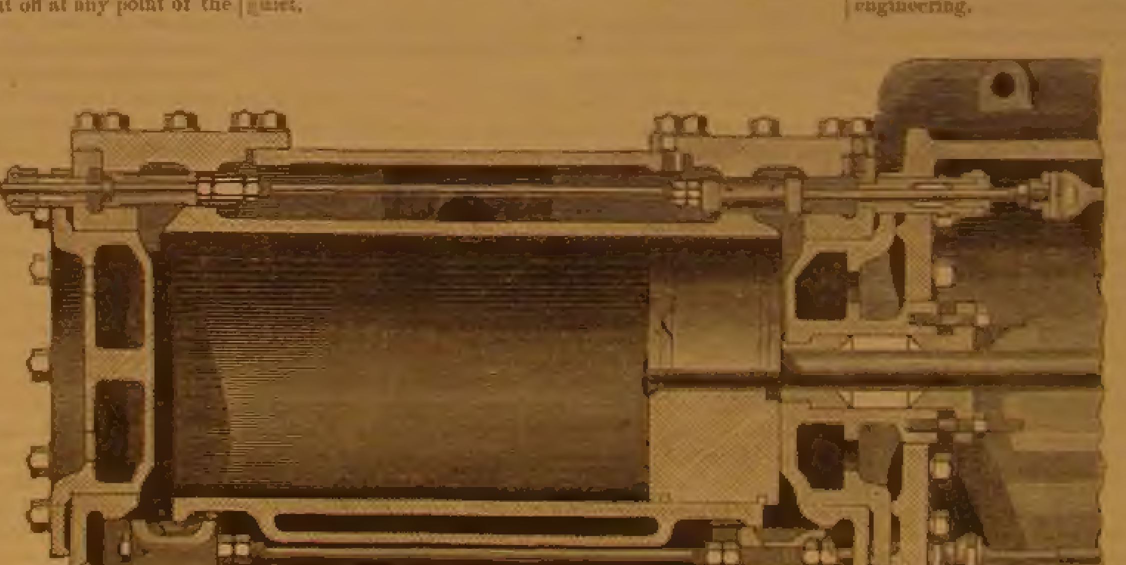
It is a variable cut-off engine, with equilibrium valves, opening large areas for admission and release, and operated by valve gear having positive movements, are admirably fitted for working at high speed. This advantage has been improved by the designer of this engine, who has sought to adapt it for running at what he conceives to be a more useful, and, in every respect, more desirable speed than the moderate gait to which engines are generally limited. Mr. John Penn, the eminent engineer of Greenwich, England, on being consulted by Mr. Whitworth as to the practicability of this innovation, replied, "High speed is wholly a question of construction."



THE ALLEN ENGINE.

having positive movements. The chief points of interest are its valves and valve gear, and its adaptation for running at high speed. It presents a novel and admirable modification of the link motion, by which the link, rigidly connected with the eccentric strap, is worked by one eccentric, which is set on the shaft in the same position with the crank. The link thus operated has movements substantially the same as those of the stationary link, as ordinarily worked by two eccentrics. From this link the admission and the exhaust valves are driven separately, the former from a movable block, and the latter from a fixed point at the extremity of the link. The position of the movable block is varied by the action of the governor, causing the steam to be cut off at any point of the stroke required, according to the resistance to be overcome, from the commencement up to the half stroke, beyond which point it is not allowed to follow. Porter's governor is used on this engine, and exhibits to good advantage its remarkable combination of power and sensibility.

The valves and their arrangement are shown in the sectional view of the cylinder. They are set on opposite sides of the cylinder, and are very easy of access. They all work in equilibrium, between opposite parallel seats. Each admission valve opens and closes, simultaneously, four passages into the port, two on each face. One of these valves is shown partly open, and the arrows show the course of the steam. Each exhaust valve opens two passages for release of the steam, the portion released past the end passing through the body of the valve, as shown.



This seems to be a common-sense way of getting a frictionless valve action. The valves rest on their lower edge, no pressure whatever comes on the working faces, and, the surfaces being of proper hardness, they do not wear sensibly in a great length of time. When necessary the covers can be let up, by slightly reducing the surfaces.

The cylinder and the steam and exhaust chambers are cast in one piece, with a belt of air interposed to protect the cylinder from the cooling exhaust current. The exhaust valves are so arranged as completely to drain any water from the cylinder. All the steam joints are scraped, and are put together perfectly tight without any packing.

The joints of the valve gear consist of hardened steel pins turning in hardened ferules secured in the rod ends. These are found wholly free from wear, while they prevent any derangement of the valve action.

It will be seen that these valves, moving without friction,

The fact undoubtedly is, that an engine may be designed and constructed never so badly, and if it is only run slow enough, may do tolerably well, but the instant it is attempted to speed it up, all its defects stand revealed, and the maker naturally concludes that high speed will never answer; while, on the other hand, an engine properly designed and constructed, may be run at any speed, and, within certain limits, we might perhaps say the faster the better.

Just so an unbalanced pulley will give no trouble while revolving slowly, that, if run swiftly, would shake the whole building to its foundation; but let it be truly balanced and we may drive it at whatever speed we choose—all is perfectly quiet.

This engine has certainly been designed with a thorough knowledge of the requirements of a high-speed engine, and exhibits in its running a degree of excellence that must be admired, and that promises a high degree of durability. We will note the points that have been presented to us, bespeaking for them the thoughtful consideration of our readers, for they open a new field in engineering, and present questions of great interest, and which will doubtless awaken much attention.

The successful running of a high-speed engine is claimed to rest principally upon the action of the reciprocating parts. It is contended that these act upon the principle of the fly wheel, absorbing the force of the steam at the commencement and giving it out to the crank at the termination of the stroke, and that if these parts are made of sufficient weight, and are run at a proper velocity, they will have the effect to transform the excessively unequal pressures, which the steam, in an expansive engine, exerts upon the piston at the opposite ends of the stroke, into a uniform rotative pressure on the crank, remedying the practical defect of the crank motion, namely, the shock and strain on each dead center, and giving the smoothness of running of a rotary engine.

The philosophy of this action was first explained by Mr. Porter, in his treatise on the Richard's Indicator, under the heading: "The Indicator Diagram not a Correct Representation of the Pressure on the Crank." It is, in brief, that the piston and rod, crosshead and connecting rod form a projectile, which must first be put in motion by the force of the steam, before any pressure can be transmitted through them to the crank that the force required to impart to them the velocity that they attain in passing through the half stroke, is readily computed, on the assumption that this accelerating force is uniform; but that, in fact—and this is the point of advantage claimed—this acceleration and the force required to produce it are not uniform, but are, precisely on the dead center, double their average, and diminish uniformly to nothing at the mid stroke, at which point acceleration passes insensibly into retardation. We have space at present only to state thus briefly the nature of the action claimed. It is certainly novel to engineers, and if real, is likely to make a revolution in engineering.

Subordinate to this leading feature in these engines, we find great rigidity, the avoidance, as far as possible, of over-hanging strains, unusual extent of wearing surfaces, with hardness and truth of form, the utmost simplicity of construction, and admirable devices for lubrication. We are assured that these engines never have a warm bearing, and that the wear of all working parts is quite insensible, as was fully shown at the Fair.

The larger engine on exhibition was tested for its economy, and effective power given off. We learn that the experiments show a consumption of about 2¾ lbs. of coal per horse power per hour, and that the engine, 16 inches diameter of cylinder, by 30 inches stroke, making 125 revolutions per minute, and rated at 125-horse power, was worked up to 140-horse power with 80 lbs. pressure cut off at about one-quarter of the stroke, and gave off upwards of 90 per cent of its indicated power. Four first premiums were awarded to the Allen Engine Works, of this city, for this engine, and other articles exhibited by them.

Dr. Doremus on the Triumphs of Modern Science.

The opening lecture of a course of lectures on the "Triumphs of Modern Science," by Dr. Doremus, at the hall of the Young Men's Christian Association, corner of Twenty-third street and Fourth avenue, New York, was delivered to a large and intelligent audience, on the evening of Thursday, Dec. 1. If space permits, we may give an abstract of this lecture in our next issue. Many interesting and brilliant experiments were gived, and others are in store for the future lectures of the course, which will be given December 8th, 15th, and 19th.

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NEW YORK, SATURDAY, DECEMBER 10, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

SCIENTIFIC DESTITUTION IN NEW YORK.

There is, perhaps, no large city in the civilized part of the world in which such utter scientific destitution prevails as in New York. However much the citizens may hunger and thirst after scientific knowledge we have no public place in the city where their wants can be supplied. There is no museum of natural history, no collection of mineralogy and geology, no accumulation of models of machinery, no zoological garden, no technological collection for the free use of the people.

We occasionally have a traveling menagerie, to which is attached a "moral drama," but the drama draws much more than the show, and the animals are evidently introduced to make the exhibition respectable.

It is true that some of our generous citizens have liberally subscribed towards a museum in the Central Park, and the Commissioners are putting forth every effort to establish the zoological garden, but it must be a long time before either of these places can be completed. At present, the animals in the Park look as uncomfortable and seedy as the forlorn building in which they are kept. We are glad to see that more comfortable quarters are preparing for them. And yet, as incomplete as everything is, multitudes of people visit the Museum in the Park, and try to draw some amusement and instruction from it.

The Board of Education, of New York, have wisely ordered that instruction be given in natural history to the 100,000 children in our public schools. They direct the pupils to be taught the uses of familiar animals, a knowledge of the principal parts of the human body, covering of animals, how they move, and the food they eat; names of common plants, trees, and flowers; and some knowledge of minerals.

We have visited a number of the schools, and were pleased to find the teachers entering upon this branch of their duties with genuine zeal and enthusiasm. They were imparting knowledge under difficulties, as there were no charts, no specimens, and no books for them to use. Some of the children had brought in a few stones, plants, insects, shells, etc., but such things as systematic collections were not to be found. It was while going the round of the schools that our attention was particularly called to the utter scientific destitution of New York, and we resolved to endeavor to excite some public interest in a question of such vital importance.

Our Board of Education have the control of more than $3,000,000 per annum, to be expended upon the schools. It never would occur to them to direct instruction to be given in geography, without the use of maps, globes, and charts. These aids are furnished as a matter of course, but when it comes to object teaching, the specimens are entirely wanting, and the poor teacher must procure them from her scanty earnings, or they must be omitted altogether.

The pupil at Dotheboy's Hall, who was set to weed the garden, was said to be studying botany. "Botany," said Mr. Squeers, "is the knowledge of plants, and when he has learned that, he goes and knows 'em." We are not certain that the system of object teaching adopted by Mr. Squeers' celebrated school was utterly devoid of good points. To teach botany without plants, or natural history without specimens, may help the memory, but not the knowledge of the pupils. It would be better to weed a little in the garden and "know 'em," than to try to commit their names to memory as we do rules of syntax.

All that is necessary to start a school now-a-days is to provide four walls and a few hard benches. Natural objects, if they find their way in at all, are brought in surreptitiously, to be afterwards swept out by the janitor. We all know that the unruly boy, who brings up a slate on the reverse of which he has drawn an unfortunate likeness of the school master, is sure to come to grief; and yet, there is scarcely a boy who does not try to draw something—a horse, a cow, or a pig—until all such nonsense is knocked out of him. Children take instinctively to animals and birds, but here in New York we are as badly off for an opportunity to study anything in the way of "animated nature" as we could well be. Is it not possible for the Board of Education to face this question squarely, and to provide suites of suitable specimens, just as they now do books, pens, ink, slates, and charts, for other branches of the public instruction?

There are in the city of New York 80 grammar schools, male and female; 96 primary schools; and 3 normal schools, including the Normal College. In all of these, object teaching ought to form a prominent part of the instruction. In many instances the grammar and primary departments are in the same building, so that 134 sets of specimens could be made to supply all the wants of the teachers. As these specimens are intended to represent common objects, the cost of them would be trifling in comparison with the objects to be gained. The chief expense would be in printing labels, and in providing suitable cases. The expenditure once made need not be repeated every year as in the case of school books, but would be in a measure a permanent investment. We venture to say that for $20,000 every school could be provided with sets of specimens of the commonest objects suitable for the use of the teachers, and we have no doubt that the Professors in the School of Mines of Columbia College, would gratuitously give their services, and present many specimens from their private collections in aid of so worthy an object.

If it is not considered feasible to have so many small collections, it is certainly possible to have a complete museum in the new building now about to be erected for the use of the Normal College; or the Board of Education can combine with the Commissioners of the Central Park in constructing and furnishing the museum designed by Messrs. Vaux and Olmsted for the Zoological Garden. Let something be done to relieve the destitution everywhere prevalent in all matters of science now so conspicuous in our great city.

TRACTION ENGINES FOR COMMON ROADS.

The illustrated description of the Thompson road steamer which recently appeared in these columns has attracted the attention of our readers to the subject of traction engines, and it may not be amiss to supplement that article by some further general remarks upon traction engines for common roads, a subject of considerable importance, since the success which has attended the road steamer referred to, and the Aveling and Porter traction engine, has demonstrated the usefulness as well as the practicability of such machines.

Many of our readers are perhaps ignorant of the chief requirements of traction engines for common roads, or at least have not had them concisely and comprehensively stated.

These requirements are quite numerous. To secure them has been a work of many difficulties, only accomplished as yet in expensive machines, like those above alluded to. These difficulties all arise from the various characters of roadways on which such engines are worked. Stones which render roads uneven and rough, sand or mud which render them heavy, all must be met as they occur, and the traction engine, which fully comes up to the requirements of the case, must be able to surmount each in turn without hesitation or material abatement of power.

Such engines are also required to ascend heavy grades with their loads, to turn around in a limited space, to run backwards or forwards, and to endure without breakage the shocks incident to travel on rough roads. And not only the observance of these conditions is essential to success, but a fair measure of economy in their working is also an essential which cannot be overlooked.

As the driving wheels must be maintained in at least an approximately fixed position relatively to the cylinders, it is obvious the introduction of springs of sufficient flexibility to take off the shocks between the axles and the superimposed parts would become a disturbing element, unless some method of compensation for the motion which they allow were devised. For every vertical motion of the body of the machine from the axles lengthens the distance between the axles and the cylinders, and if not, as we have said, compensated for, this lengthening and shortening will interfere with that nice adjustment of parts so necessary to the successful use of steam as a motor.

The employment of the soft rubber tire, as used in the Thompson road steamer, and also in the Aveling & Porter traction engine, obviates all necessity for the use of springs between the axles and the parts which they support, but such tires add greatly to the cost of the machine, give the wheels a clumsy appearance, and certainly forbid the attainment of a speed suitable to passenger traffic.

Rubber tires give great tractive power, but it has been shown that on roads of ordinary smoothness an iron surface will bite sufficiently for most purposes, and will ascend moderate grades with facility.

A method of gradually changing the speed of revolution in the driving wheels, while the speed of the piston and the power of the engine remain unchanged, is a great desideratum in engines of this class. This and this only will enable them to regulate their power and speed in exact proportion to the increased resistance offered by increase of grade, or those offered by changes in the character of roadways. A mechanical movement, by which such a change of motion can be effected, already exists—namely, two cone pulleys connected by a belt; but this movement is not sufficiently positive nor adapted to the transmission of great power in small space. Something which occupies little space and will transmit positively a great power at low speed is what is wanted, not only for traction engines, but for other purposes.

Great as has been the success of the Thompson road steamer, we do not believe that in it that engineer has reached the ultimatum, and we have confidence that Yankee genius is yet to show that the traction engine for common roads which shall be capable of running at high or low speeds, for the transportation of passengers or freight, and shall cost much less than the English machines, is within the limits of the possibilities.

SAFETY VS. ECONOMY IN STEAM BOILERS.

An esteemed Boston correspondent writes us as follows:

"Your able article on the Nitro-Glycerin Explosion at Fairport, Ohio, should be followed by one entitled, 'How Long Shall Boiler Explosions Continue?' recounting the terrible explosion at Anderson, Ind., where the memory of the explosion at the Indianapolis State Fair is still vivid in the minds of the inhabitants, and where five human beings were killed, and a lady sitting in her own private dwelling was torn to pieces. If such sacrifices of human life were the well known conditions on which we could gain the benefits of the steam engine, as a Christian nation, we would indignantly refuse to purchase those benefits at such a cost. But the laws governing steam are so well understood that any first-class engineer can construct a steam-boiler that under any and all possible conditions can cause no such disasters. There are a number of steam-boilers now manufactured, that cannot, even with the greatest negligence, be made to explode, and which are sold for less money, occupy less space, and use less coal, than other boilers, yet still the work of destruction goes on, and life and property are sacrificed. 'How Long Shall Boiler Explosions Continue?'"

This is not the first time this question has been asked, but, in view of the often recurring explosion of boilers, it loses none of its pertinence through repetition.

We are not sure, however, that we can fully indorse our correspondent's statements in regard to the boilers for which he claims entire safety. We grant their safety, and their less cost, but we have yet to be convinced that they will produce more dry steam per pound of coal than other boilers. If their evaporative power is really greater, nothing is easier than to prove it; but it must always be remembered, that mechanically passing water in the form of spray, through a boiler, is not evaporation, and that from true evaporation only is all the mechanical power of a steam engine derived. It seems to us, that were the claims made for greater economy fully established, manufacturers and boiler-users generally would not be slow to respond to an appeal made to their own interest, and that these boilers would speedily replace all other boilers with which they now compete.

But, granting the safe boilers to be *less* economical of fuel than the unsafe ones, it is still questionable whether economy is not too dearly purchased, at the general risk, and the too frequent sacrifice of human life and limb, and we believe that unsafe boilers ought to be legislated out of the market, if such legislation is possible.

It is somewhat difficult to conceive a law that would enforce the proper care in attendance, or prevent the use of boilers improperly constructed. Any system of legal inspection cannot be sufficiently thorough, without subjecting careful, conscientious boiler-users to much inconvenience, brought upon them by the neglect of the unscrupulous and the ignorant; and opinions so differ upon the proper mode of construction, that the exclusion of any particular class of boilers from sale, on the ground of its dangerous character, would be found impracticable.

Something, however, ought to be done to punish the criminal neglect from which the large majority of boiler explosions originate, and the law on this point ought to be made so rigorous that neglect through parsimony, or from any other cause, should entail penalties which even the most reckless would respect.

GUN COTTON AND COLLODION.

There are some facts relative to the early history of gun cotton that are not generally known. When Schoenbein first discovered it, in 1846, he kept the method of its preparation secret, and proposed to sell it to the German Government, as a substitute for gunpowder. He called it "explosive cotton," and tried many experiments in blasting rocks, artillery firing, etc. The French chemist, Pelouze, had previously prepared a somewhat similar compound, by the action of nitric acid on wood, and he claimed the priority of discovery in consequence. He proposed the name "pyroxyline," from the Greek, meaning *fire-wood*. While the matter was still a secret, and with no further knowledge than that cotton had been converted into an explosive compound, the late Professor Ellet, of South Carolina College, invented the best method for the manufacture of gun cotton that has been found. He at once communicated it to the Legislature of South Carolina, and received the thanks of that body, December 3, 1846. His method was to employ a mixture of sulphuric acid and saltpeter. About the same time Dr. John P. Maynard, a medical student, from Dedham, Massachusetts, proposed to use the solution of gun cotton in surgery. He published an account of his experiments in the *Boston Medical Journal*, in 1848. Dr. A. A. Gould, of Boston, advised him to call this new liquid *collodion*, from the Greek word *kollodes*, glue, and this name was accordingly adopted. Previous to Dr. Maynard's researches, the solubility of gun cotton in a mixture of alcohol and ether was not known, and to him we are therefore indebted for the introduction of collodion.

It will thus appear that the world is largely indebted to two Americans, Professor Ellet and Dr. Maynard, for a knowledge of the manufacture of gun cotton and of collodion, a fact that ought not to be lost sight of in the history of these important compounds.

HOW SHEET MUSIC IS PRINTED.

Passing, the other afternoon, by the music publishing house of John L. Peters, 599 Broadway, New York, it occurred to us to ascertain in what way the sheet music, of which enormous quantities are constantly issued, is printed. It will be evident to any one having a slight knowledge of printing, as performed with movable types, upon a very casual inspection of a sheet of music, that some peculiar method is employed. Not that movable types cannot be used in printing music; they are so used, to a large extent, in music-book work; but sheets of music show lines intersecting lines, and slurs and hooks superimposed upon staff-lines, in a way that gives a superior elegance of appearance, unattainable by the use of movable types.

To learn the details of the art, we stepped into Mr. Peters' establishment, and found that, as in most practical operations, simplicity is the chief characteristic of sheet music printing.

Suppose the compositor to have placed in his hand a manuscript musical composition. To prepare a plate from which this music can be indefinitely printed, he selects a thin sheet of soft metal, of the proper size, and sinks, by the use of a machine constructed for the purpose, the staff-lines into the metal. When this operation is completed, he proceeds to sink in the notes, rests, points, bars, slurs, etc., by the use of suitable punches, each musical character, or element of a character, having its appropriate punch.

The plates thus prepared have thus produced upon them the piece of music, in sunken characters, which characters are next filled up to the uniform level of the plate with beeswax. The musical notation now appears as if printed in wax upon the plates, the surfaces of which are highly polished.

To print from these plates, the ink is first distributed uniformly over the entire surface, by a hand roller. The surfaces are then wiped off with a cloth, which removes all the ink from the polished parts, while it still adheres to the wax in the punched depressions. This part of the work is performed by a special workman, who, when he has completed it, passes the plates to the pressman.

The latter lays the paper upon the surface of the plates, and then passes them through the ordinary lithographers' press.

The process bears considerable analogy to ordinary lithography. In the latter process, the design is drawn upon the plates with chemical inks, which penetrate and change the character of the surface, so that the inks used subsequently in the printing adhere to the lines of the drawing, but are easily wiped off the remainder of the plate. A similar result is attained on the music plates, but by entirely different means.

TECHNICAL EDUCATION.

[Report of the Committee of the Trustees of the Rensselaer Polytechnic Institute, on the System of Instruction, with Proposed Modifications.]

While so much is being thought, written, and said on the subject of technical education, and while so much that is said and written has little to commend it to the attention of earnest thinking men, it is refreshing to meet with a document upon this important topic, bearing upon its face the stamp of sound common sense, and freedom from that conservatism which has too long retained in our system of education much that, if not really worthless, is at least comparatively so, when contrasted with what might constitute the curriculum of a modern school. This conservatism has, while making concessions to the modern demand for scientific and technical learning, still clung to the old course of training, so that the number of studies pursued in our colleges has become so much increased as to become cumbrous in the extreme, and to tend rather to superficiality, than thoroughness in any department of learning.

No one can fail to see signs of a great revolution in the management of our higher institutions of learning. The modern mind no longer has faith in classical study as the best preparation for a successful career in active life. It demands a change, and the change is being gradually conceded by the schools.

One of the most significant of the movements originating in the state of things to which we have alluded, is the action of the Trustees of the Rensselaer Polytechnic Institute, who, in response to a wide-spread conviction among the graduates of that institution, that the studies pursued comprised too much of the purely theoretical, and too little of the technical, appointed, March 14, 1870, a committee to consider what change, if any, might be advantageously made in the courses of study pursued.

The committee consisted of Messrs. E. Thompson Gale, A. L. Holley, and C. E. Dutton, and the investigations and recommendations are embodied in a report of singular ability, the title of which we have given at the head of this article.

As a first step, the committee sought the advice of eminent educators and engineers at large, addressing to them a circular letter containing the following questions, which themselves sufficiently indicate the practical wisdom which the committee brought to bear upon the investigations:

1. Does the course of study announced in the Catalogue (a copy of which is also sent you), embrace too great a proportion of the higher mathematics, and too small a proportion of the natural and physical sciences; or could the former be curtailed and the latter increased with advantage?

2. Does the course of study seem to you to embrace too large a proportion of purely theoretical instruction, and too small a proportion of practical instruction?

3. Considering the qualifications demanded of American civil and mechanical engineers, is there any study omitted in the course which ought to be introduced; it being premised that such an addition involves a corresponding reduction in some other study already prescribed?

4. Do you think it would be feasible to impart elementary instruction in practical and mechanical engineering, by means of lectures, given by experts, in machine shops, and on the ground where construction is going on; the object being not only to better fit men for practice, but to illustrate and vitalize theoretical study; or would such instruction be too superficial to warrant the necessary expenditure of time?

Abstracts from twenty-four replies to the circular letter are printed in an appendix to the report.

While they indicate a great diversity of opinion on many points, there seems to be a general opinion that the course of mathematics *should not be curtailed*, so far as it relates to civil engineering; but while this opinion was generally expressed, the strengthening of the practical element in the course of training was deemed of equal importance.

To understand the force of these opinions it is necessary to know that the courses of study in the institution are four in number, viz., Civil Engineering, Mechanical Engineering, Mining Engineering, and Natural Science. The report informs us that two of these have only a nominal existence. "The course in Mechanical Engineering is not given, and that in Natural Science graduated only one student at the close of last year."

Practically, then, the instruction in this institution, instead of being polytechnic, is confined to mathematics and civil engineering. And though it has acquired an enviable reputation for thoroughness in these two departments of science, it falls far short of being what its name might lead those unacquainted with its management to infer.

In order to give an idea of the full scope and meaning of the word "polytechnic," as applied to an institution of learning, the report proceeds to detail the characteristics of the school system of Germany, from which we make the following extract, containing much condensed information in regard to one of the most perfect educational systems in the world:

"It is necessary to premise that the whole range and scope of education, from the highest to the lowest, is, in all the German States, supervised and sustained by the governments. There is no question there whether government ought to undertake the higher education of citizens. It assumes it as a duty and a privilege; and though it requires that those who receive its benefits should pay part of the expense, it sees to it that nothing is lacking, which is in its power to provide, to the widest development, most thorough efficiency, and ample equipment of all its schools, from the highest to the lowest. Hence it has come to pass, that not only is every grade of public school the best possible in itself, but it is part of a great system. The schools are graded in such a manner, that each lower grade is preparatory to a higher, and each higher grade begins where the next lower left off. Up to a certain period and stage of development, the course of education in the public schools is uniform for all pupils. Beyond it, there is a divarication into two parts, one of which is chiefly literary, and has its culmination in the university; the other, scientific, culminating in the polytechnic school. These embranchments are co-ordinate, equal and complementary, each representing an education upon a basis, to a certain extent peculiar and distinct. The preparatory school for the university is the *gymnasium*, which corresponds pretty nearly to our American college,—the university itself being a type of organized education which cannot be adequately represented by anything in this country. The preparatory school for the polytechnic is the *real-school*, which has not the remotest trace of a representative among us. In it are taught the whole range of the lower mathematics, including plane geometry, algebra, trigonometry, and conic sections; also the elements of the physical and natural sciences, with the languages, including Latin, French, and generally English, and those moral, ethical, and æsthetic branches which are deemed absolutely indispensable to what is understood to be a liberal and thorough education. When the pupil of the real-school enters the polytechnic, he is reasonably proficient in every kind of general study, excepting the higher mathematics. Henceforth his efforts are occupied with higher and technical studies alone. He has mastered the elements of nearly everything which can be systematically taught, and all that remains is to give special, and in some cases, extended developments to certain branches, selected with reference to the trade or profession he expects to pursue. Among the many excellencies of this admirable system, it will be seen that the polytechnic schools are not hampered with the early and preparatory education of the scholar, but have solely to deal with his professional training, a feature, the importance of which cannot be exaggerated, and which relieves the schools of one of the most perplexing and annoying difficulties which your committee have been compelled to face."

The committee indicate in the last portion of the above quotation, a difficulty which, in the present state of American education, is well nigh insurmountable. A school system to be effective in the highest degree, must comprise in its provisions the regular and systematic gradation of study from first to last. As matters now stand with us, we have separate and widely differing systems of primary instruction, and there is no uniformity in the studies of intermediate schools. The consequence is, that, while for higher institutions many pupils may be well enough prepared in some things, all have not had the same training, and most are in some respects utterly deficient. Their deficiencies have subsequently to be supplied, and their acquirements to be brought to some common level before uniform progress can be made.

But we are extending this article much beyond what we first intended. The fertility of the subject tempts us to expand still further, but we must close. The report under consideration is one of the most important and instructive papers upon the subject of technical education in America, we have ever met with, and its wide circulation would be extremely desirable.

Eighteen hundred men make a locomotive engine in one day—boiler, cylinders, frame, driving wheels, truck, stack, cab, pilot, and tender, complete—the speed of forty miles an hour and the power of a thousand tuns created in a day.

MICRO-PHOTOGRAPHY.

Micro-photography is the word employed to signify the manner of taking photographs of microscopic objects as they appear when magnified. The process, or at least a modification of it, was known as long ago as 1840, when daguerreotypes were taken in this manner, and the plates afterwards engraved for printing. There are two methods used at present, namely, with the microscope itself brought into a horizontal position, and the eye-piece fitted into the camera box; or, by using instead of the compound microscope an instrument consisting of the table and stage of the microscope, so arranged as to carry the objective and necessary focusing apparatus, at the same time screwing into the flange of an ordinary camera.

The most ingenious apparatus has been contrived by Dr. Woodward, of the Army Medical Bureau, in Washington, and he has found the magnesium and electric lights to yield the best results. Some of the specimens of infusoria were magnified 2,500 diameters.

So much for the micro-photography, or photo-micrography. We have now the information of the practical use of the reverse process in reducing large objects to very minute ones, and thus obtaining a microscopic photograph. One side of the London *Times* has been reduced to the size of the finger-nail, and photographed so sharply as to be legible with the microscope. The apparatus for producing this effect is the opposite of the one just described, and it is now proposed to use it for the conveyance of intelligence into Paris, by means of carrier pigeons.

Telegrams, news items, and intelligence from all parts of the world, is pasted on a wall, and a microscopic photograph taken, a print of which is made upon tissue paper less than an inch square. If, by good luck, this message should reach Paris, it is enlarged according to Dr. Woodward's process, and becomes legible to the naked eye, and copies can be taken for distribution.

It is curious to see a department of scientific research thus suddenly appropriated for carrying information on the common affairs of life. We certainly can never predict to what uses a scientific discovery may some day be applied.

Concrete and Iron Bridge.

A new bridge erected for Sir Shafto Adair, from the designs of Mr. H. M. Eyton, of Ipswich, over the Waveney, at Homersfield, England, has been recently tested. In designing the bridge advantage was taken of the principle of Messrs. Phillips' patent fire-proof construction, a system in which all the ironwork is completely embedded in Portland cement concrete. The bridge has one arch of a clear span of 50 feet, with a rise of 5 feet 3 inches. The skeleton of the bridge is of iron, and this is entirely filled in with Portland cement concrete, and rendered with Portland cement, thus forming one continuous beam, getting stronger every year, in addition to the iron skeleton, which is of itself sufficient to do the ordinary statical work of the bridge; the weight of concrete alone is over 100 tuns. The spandrels of the bridge are relieved by a raised panel, and in the center is a casting of the Adair arms, taken from the old three-arched brick bridge. The first test applied was that of a five-tun road roller drawn by four horses. This was passed across several times, and not the least deflection was perceptible. Afterwards a heavy wagon, laden with sacks of flour, weighing altogether six tuns, was passed over, and still, it is stated, no deflection could be noticed.

St. Louis Bridge.

The following is a brief statement of the condition of the work upon the bridge at St. Louis, according to the latest advice from its constructor, Jas. B. Eads, C. E.: "The masonry of the west abutment is about fourteen feet above the present stage of the river. The western pier is about sixteen feet, and the eastern pier about four feet above water. The laying of the masonry is progressing on the west abutment, and on the east pier. The granite (from Portland, Me.) for the west pier is on its way up the river. Some fifty or sixty vessels, laden with granite for the work, are now upon the ocean, and two cargoes on their way up the Mississippi from New Orleans. No further delay is therefore anticipated on account of material for masonry. The caisson for the eastern abutment is nearly finished at Carondolet, six miles below the city, and will be launched and placed in position in about two weeks. This abutment will be sunk to the bed rock, 136 feet below extreme high water mark, and will consequently penetrate eight feet deeper than the pier which was put down last winter. These four masses of masonry constitute the foundations for the bridge proper, those for three of the smaller piers in the western approach have already been put in, the deepest one extending twenty-one feet below the city directrix. This one has been recently put down, and is nearly completed to the wharf level.

The Vitality of Seeds.

The following schedule gives the length of time that seeds will grow, if properly kept, but it is true that some varieties will even keep longer than the period mentioned, but their strength will be greatly impaired. Imported seeds of all kinds lose their vitality much sooner than those of American growth, which is occasioned by the dampness which they absorb in transit across the ocean. Seed of all kinds should be kept in a dry situation, and in sacks, in preference to barrels. Asparagus, cabbage, Brussel sprout, cress—four years; beans, borecole, cauliflower, celery, corn salad, lettuce, mustard, okra, parsley—three years; carrot, corn, wheat, oats, broom-corn, egg plant, endive, leek, onion, peas, pepper, salsify, tomatoes—two years; beets, nasturtium, pumpkin, radish, squash, turnip—five years; cucumbers—ten years, melon—six years; parsnip, wrinkled peas, rhubarb seeds, spinach—one year.

SCIENTIFIC AMERICAN.

1871.

Special Club Premium.

A New Volume of this journal will commence on the first of January next. Any person sending us yearly clubs for ten or more copies will be entitled to receive, free of postage or express charge, one copy of the celebrated engraving, "MEN OF PROGRESS," for every ten names.

[illegible] the finest art works of the day, possessing a rare and peculiar [illegible] curacy of the personages it represents. The scene of the picture is laid in the great hall of the Patent Office, at Washington. The grouping is spirited and artistic. Among the persons represented are the following eminent inventors: [illegible]

[illegible] from the depths of poverty, and by their wonderful discov- [illegible] but fitting that the remembrance of their achievements, and the honored forms of their persons, as they lived and walked among us, should be perpetuated by the highest skill of art. The picture, which is three feet long and two feet high, forms an enduring and desirable object for the adornment of the parlor. It was engraved by the celebrated JOHN SARTAIN, from a large painting by SCHUSSELE, and all the portraits were taken from life. Every lover of Science and Progress should enjoy its possession. Single copies of the Engraving $9. Three copies, $25.

One copy of the SCIENTIFIC AMERICAN for one year, and a copy of the Engraving, will be sent to any address on receipt of $10.

MUNN & CO.,
37 Park Row, New York City.

OATS.—The Scotch are great eaters of oat-meal grits, and in this city the consumption of this article of food is largely increasing. Unlike wheat, the muscle-making materials in oats are not connected with the hull and are not therefore, removed and lost in making fine flour. The eaters of oats are strong, enduring, and thoughtful; those who subsist largely on buckwheat and rice have far less power in these important respects. The oats should be cracked and separated from the hull then allowed to soak over night in milk, and boiled in the same material. With cream and sugar or sirup the dish is very palatable.

WOODEN WATER PIPES were recently taken out in Woodward avenue, Detroit, laid there forty three years ago. The wood is apparently as sound as ever, showing no signs of decay, even retaining the bark, and on cutting through it into the wood the timber was found as bright and sound as ever. [illegible] pipes were made of tamarack logs, about sixteen feet in length, and eight or ten inches in diameter, bore of log, three inches in diameter. The pipes were disconnected from the distribution pipes several years ago. They were embedded in clay at a depth of four or five feet.

A CAUTION TO LADIES—DEATH IN THE CHIGNON.—A correspondent from Liberty, Pa., writes that a physician of that place has discovered a species of microscopic insect which infests the material used for chignons called mohair. These insects enter the scalp and cause speedy death. He states that a young lady, who had been wearing the article in question, now lies in a critical condition, her scalp being filled with [illegible] insects, and her recovery is considered hopeless by the best physicians of the locality.

"THE trials made with a view of testing the stability of the *Monarch*—considered one of the most powerful English iron clads in the world—are said to have been 'very unsatisfactory,' and the ship, it is understood, will not proceed to sea with the Channel Squadron on its next cruise." Commenting on the above item, a Manchester paper very sagely remarks: "If our turret ships are unseaworthy, it can be no adequate compensation to us to know that they are no worse than the turret ships of other nations."

ATLANTIC CABLES CEASE WORKING.—The cable of [illegible] 1865 have, since Thursday last, [illegible] ceased working altogether [illegible] the French cable has [illegible] to transmit eastward [illegible] with the usual facility. This peculiar freak of the French cable is up to the present writing unexplained. It is evident that to secure uninter- [illegible]

CURIOUS PHENOMENON.—The Bridgeport Manufacturing Company send us the following extract from a letter to Mr Wm. Belk, of Mount Vernon Lime Company, Iowa: "My well is dug and walled through 30 feet of clay, then drilled through 8 feet more of clay, and 32 feet of rock. The water stands just at the top of the drill the year round, except at the change and full of the moon at these times it rises 18 inches into the dug well, and gradually subsides until the moon quarters. This I have noticed for over twenty months."

WE publish elsewhere the prospectus of the New York *Times*, a journal we are happy to recommend to our readers. The *Times* is very ably edited, and contains all the intelligence of the day—literary, political, social, and financial. As a family journal it is exceptionally good. No parent need fear to allow the children to read the *Times*.

RUSSIA has nine universities all under the control of the government. The largest, that of Moscow, has seventy five professors and one thousand six hundred students.

RECENT dispatches announce that the Suez Canal has passed into English hands and is henceforth to be managed by an English joint stock company.

QUERIES

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—SOLDERING SPRINGS.—How can I solder a piece of spring wire (either brass or steel) to another piece of metal with hard solder without softening the wire, or at least without destroying its elasticity? I see brass pin tongues, at least they appear to be common spring brass, and are soldered to the joint with hard solder, but I cannot imagine how this can be, as I suppose it takes a red heat to [illegible] hard solder and a red heat will destroy the elasticity of spring brass.—J. E. W.

2.—EMERY WHEELS.—How can I make emery wheels. I need them sometimes of peculiar shape. I do not need any over two inches in diameter.—W. E.

3.—REMOVING TATTOOED MARKS.—Is there any process by which India ink can be removed from the skin? When a boy I was so foolish as to greatly disfigure my hand by tattooing, and it has been an eyesore to me ever since. How can I obliterate the marks? All the suggestions I have tried have failed.—G. B.

4.—WIRE OF SOLDER.—Can solder be drawn into wire? or how can it be got into that form?—E. E. D.

5.—GAS-TIGHT COATING FOR FABRICS.—What is the best gas-tight coating for fabrics of silk, linen, woolen, etc.?—L. Van A.

6.—SCREW PROPELLERS.—How will the revolutions of a screw propeller be affected, respectively, when the vessel is running in still water, when it is running with the tide or against it? Or in other words will the revolutions per minute be greater when running in still water than when running against the tide, and greater when running with the tide than when running in slack water carrying the same steam pressure in each case?—F. G. F.

7.—TELODYNAMIC CABLE.—Suppose a sixty saw cotton gin on a hill, and a six horse engine at the bottom of the hill (near water) one hundred yards apart. A grooved wooden pulley is attached to the driving wheel of the engine to carry a ½ inch wire rope running in the groove, the pulley to be large enough to maintain sufficient adhesion, without too great tension. A pulley of the same size is placed at the top of the hill, grooved as is the one at the engine. A band pulley is attached to this top pulley the size of the driving wheel of the engine, and a band passing from this pulley to the gin thus running at the same speed, as if belted directly with [the dri]ving wheel of the engine. What percentage of the power of the engine is expended in driving the two pulleys and the ½ in. wire rope, the whole length of the rope being 200 yards? If the rope passed over a ravine perhaps there would be no necessity for idle pulleys to prevent sag, otherwise there would be two idle pulleys half way between the engine and the gin.—J. [illegible]

8.—STEP FOR WATER WHEELS.—The bottom bearing of a [illegible] being of hardened steel, what is the best material for the step? [illegible]

[illegible] [RAIS]ING WATER.—What would be the friction of pip[e] [illegible] of piping a distance of 1,400 feet off and up a slope of twenty five feet [illegible] in having the pipe enter a large pipe or cylinder just before entering the pump, in order to make the flow of water from the spring more uniform and easier on the pump? No doubt many of your readers have had all the practical experience wanted to just such a case. One wells fall in the limestone regions of this State (Georgia) in summer and fall. Such is the case at my mill. I am using one of Woodward's steam pumps at the mill [illegible] the [illegible].—A. J. W.

11.—BARKER'S MILL.—What is the cause of the motion of this machine? I have never seen what I consider the true cause assigned. [illegible] pressure [illegible] the water [illegible] under the head of water in the shaft. With a shaft containing a depth of water four feet, and arms projecting two feet, the arms would make about seventy seven revolutions per [illegible] Queries about and which is not correct.—CYRUS.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer [illegible]

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely [illegible] when paid for as advertisements at $1.00 a line, under the head of "[Busi]ness and Personal."

All reference to back numbers should be by volume and page.

POWER OF ENGINES.—In answer to J. B.'s query, in No. 21 current volume, I give the following rule. To find the number of revolutions per minute divide the number of foot pounds in the required horse power (equal to the number of horse power multiplied by 33,000) by pressure on the surface of piston; divide the quotient by the [illegible] feet the piston travels for each revolution, and this quotient will [be the] required number of revolutions per minute. To find the [illegible] square inch, divide the number of foot pounds by the number of feet piston travels per minute, the quotient will be the entire pressure on the piston, which, divided by the number of square inches in the piston, will give the required pressure per square inch. lb.—M. M., of Mich.

GLAZIER'S DIAMONDS.—In answer to E. P. G.'s query, No. 22, current volume, I would say that as the diamond spark in a glazier's diamond has many angles, it can be reset to act as well as ever. E. P. G. can unscrew the head in which the diamond is set, and stating kind of stock it belongs to, and if to cut thick or thin glass—send it by mail to any good manufacturer of glaziers' diamonds, and have it reset at small cost.

TO PUMP HIGHER.—Answer to query 6, in No. 22, SCIENTIFIC AMERICAN. If a small hole be made in the suction pipe, about ten feet above the water in the well, the air will enter and mix with the water in the pipe; and as the mixture is much lighter, it will rise to a higher point than water alone. "J. S. F." will find this matter treated of in "Ewbanks' Hydraulics, pages 276-8, edition of 1842.—T. J. W. H.

REMOVING PAINT AND TAR.—"Old Tar," who inquires in No. 21, current volume, for a method of removing oil paint and tar from old clothe, can do so by soaking them in a solution of potash.—G. F., of [illegible]

R. S., of Ill.—We know of no way whereby ordinary fermented bread can be kept for a long time, except by drying it perfectly. A patented process for effecting the desiccation of bread is as follows: Well made and well baked bread is exposed to a current of dry air; the evaporation of the moisture should be slow, in order that the bread may not crack. The duration of this drying process varies from eight to fifteen days, and depends on the size of the loaves and the form of drying apparatus adopted. If the bread were compressed in the state in which it is left by the desiccation it would break, and to prevent this it must, before being pressed, be submitted during four or five minutes to a heat of from 150° to 200° C., in a stove filled with steam. To effect this operation the bread is arranged in layers, separated by iron plates, which form molds in which the bread will assume the shape and size previously determined [illegible] consequence the bread becomes soft, although it will have absorbed but a very small quantity of water, the load or batch is then withdrawn and pushed by means of a carriage between two pressing plates, in order to be compressed. Any press will serve, but as the pressure should be rapid and powerful the hydraulic press is best. The bread should remain in the press for twenty four hours. It may then be removed, is dry and cold, and will preserve the shape which has been impressed upon it. The bread thus prepared is packed in cases to preserve it from insects, and, it is said, will keep several years.

J. S. B., of Tenn.—Milk should not be kept in leaden vessels, [illegible] case is recorded by Dr. Darwin of a farmer's daughter, who used to wipe the cream off the edge of the milk, which was kept in leaden cisterns, and being fond of cream licked it from her fingers. She was [illegible]

J. E. W., of N. H.—Gun-flints are so little employed now, that [illegible] You may find it fully described in Dr. Ure's "Dictionary of Arts, [illegible]"

C. R. S., of Mass.—The metals found in meteoric stones do [illegible] will enable you to get the right proportions. This various answers very [illegible]

L. M. V., of Mich.—If you have, as you say, invented a cheap [illegible]

T. D., of N. Y.—The sample of clay sent will not make good brick, it contains too many limestone fragments. In burning, these fragments will be made into quick lime, which subsequently slacking, will [illegible]

W. B. G., of Ohio.—Will a steam pump throw water as fast when the pump stands twenty feet above the water, as when it stands four feet above the water? *Answer.* No.

J. R. K., of Wis.—Your mixture for waterproofing boots is, we think, patentable. All such articles are readily salable if good and [illegible]

L. H., of N. Y.—The yellowish color of tartar emetic is not [illegible] has a yellowish color when powdered.

M. L. G., of S. C.—For answer to your inquiry, see "perpetual [illegible]

W. H. H. H., of Pa.—You should apply to an expert steam [illegible] would make too great demands on our time.

[illegible]

J. P., of ——.—In our column devoted to queries, we do not propose to give space to questions of a merely speculative nature. W[illegible]

F. L. and T. L. C., of Ill.—It will not interest our readers to know that you have discovered a flux for welding cast steel to cast steel, [illegible]

W. R., of N. Y.—We have seen nothing from which to infer that the nitro-glycerin explosion, at Fairport, produced any [illegible]

L. M., of Mass.—A recipe for polishing marble was published on page 98, current volume.

R. J., of Ill.—We think your chair is patentable. A good [illegible]

Business and Personal.

[illegible] *Three Four Lines. One Dollar and a Half per Line will be charged.*

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

"507 Mechanical Movements." This Illustrated Book now in its 4th edition, embraces all departments of Mechanics, and is invaluable [illegible] Price $1. By mail $1 12. Address Theo. Tusch, 37 Park Row, New York.

Patent for Sale—A Watchmaker's Tool for topping, rounding, [illegible]

Self closing Telegraph Key—Frey's Patent. Liberal terms to Agents. Call at, or address, A. Illing, 213 Church st., New York.

Diamond Carbon of all sizes and shapes, furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances, by John Dickinson, 64 Nassau st., New York.

Wanted—A Partner, with capital, to take an interest in and manufacture two articles, under separate patents, for Iowa and Minnesota. Address H. R. Averill, New Oregon, Iowa.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Patent Elliptic-geared Punches and Shears.—The greatest economy of power, space, and labor. Can be seen in operation at our factory, in Trenton, N. J. Address American Saw Co., 1 Ferry st., New York.

Hand Screw Punches and Lever Punches. American Saw Co., New York.

For Sale—The entire Right of the best Adjustable Wrench. Price $3,750. J. F. Rouse, at Chickering's Factory, Boston, Mass.

Corn-shuck Collars.—C. H. Leffler, of Montgomery, Ala., wants a machine that will receive the Corn Shucks and plait them into a collar.

Rotary Steam engine.—A new patent for a superior improvement in Steam Engines, patented this week. The whole or portion of territory for sale. J. N. Powers, Greenfield, O.

Self-testing Steam Gage—Will tell you if it is tampered with or out of order. The only reliable gage. Send for circular. E. H. Ashcroft, Boston, Mass.

The Darling Self-supplying Penholder, writing 1400 words at a dip, mentioned Nov. 19, page 331, sent by mail. Desk holders 25c., pocket holders $1 50. R. L. Goulding, 105 Fulton st., New York.

An active man who is a rapid workman in iron, knowing something of the general variety business, and who possesses good managing abilities, can hear of an opening by addressing W. M. Tilden, Pittsburgh, Pa.

R. R.—Some Engine builders are too penurious to put on first class Lubricators and Oil Cups. The best are made by H. Moore, 41 Center street. Send there for a circular.

Excelsior Stump Puller & Rock Lifter. T. W. Fay, Camden, N. J.

Rawhide Sash Cord has no equal for heavy windows or dumb waiters. Makes the very best round [illegible] Darrow M'f'g Co., Bristol, Conn.

Wanted—Hooks for my Carpet Molding. Address J. H. Stanton, Franklin, Ohio.

Scientific American—Back Vols and Nos. for sale. Volumes bound, $3. Nos. 10c. each. Address Theo. Tusch, 37 Park Row, New York.

Thrifty Mechanics, who require no discounts, but desire a safe place of deposit for their earnings in an institution where they can enjoy all the advantages possessed by Banks of Circulation, with the additional one of drawing interest on their accounts, are referred to the advertisement of the Mutual Benefit Savings Bank, published in our advertising [illegible]

Peteler Portable R. R. Co., contractors, graders. See adv'ment.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

The Merriman Bolt Cutter—the best made. Send for circulars. Brown and Barnes, Fair Haven, Conn.

Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," [illegible] in all Art Stores. "Three Tom Boys" [illegible]

Manufacturers and Patentees.—Agencies for the Pacific Coast wanted by Nathan Joseph & Co., 619 Washington st., San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

To Cure a Cough, Cold, or Sore Throat, use Brown's Bronchial Troches.

Machinery for two 500-ton propellers, 60-Horse Locomotive Boiler, nearly new, for sale by Wm. D. Andrews & Bro., 414 Water st., N. Y.

A very Valuable Patent for sale, the merits of which will be appreciated at sight. Apply to or address Jewell & Elden, 93 Liberty st., N. Y.

Improved Foot Lathes. Many a reader of this paper has one of them. Catalogue free. N. H. Baldwin, Laconia, N. H.

Lighting Gas in Streets, Factories, etc., with Bartlett's Patent Torch saves great expense, all risks, etc. It is being adopted everywhere. Address J. W. Bartlett, 569, Broadway, New York.

Japanese Paper-ware Spittoons, Wash Basins, Bowls, Pails, Milk Pans, Slop Jars, Chamber Pails, Trays. Perfectly water-proof. Will not [illegible] or rust. Send for circulars. Jennings Brothers, 352 Pearl st., N. Y.

Belting that is Belting.—Always send for the Best Philadelphia Oak Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Mays & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

Parties in need of small Gray Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

Best Boiler-tube Cleaner—A. H. & M. Morse, Franklin, Mass.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office 98 Liberty st., New York.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser 116 Fulton st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

Cold Rolled-Shafting piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Incrustations prevented by Winans' Boiler Powder, 11 Wall st., New York. 15 years in use. Beware of frauds.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

[illegible] Anti-Incrustator for Steam Boilers—The only reliable [illegible]

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent [illegible]

Shuttle.—Walter Dennett, Springfield, Ill.—This invention relates to improvements in shuttles, and consists in an improved arrangement with the [illegible] shuttle inside, and arranged to close down by the inside of the recessed side so that the thread will be retained in the eye by the upper edge of the shuttle side. The said improvement is mainly designed for sewing machine shuttles, but may be applied to others.

Brick Mold.—Samuel R. Taylor, Jacksonville, Ill.—This invention relates to improvements in brick molds, and it consists in a novel arrangement of handles with the end pieces of the mold, which are hinged to the side pieces, for opening to free the bricks and the side pieces, which spring open when the ends are free when discharging, by which the handles are made to clamp the said sides and ends tight for receiving the clay, and to release them when the bricks are to be discharged.

Gate.—Elijah Gumberling, Elkhart, Ind.—This invention relates to improvements in gates, and consists in hinging the gate to the post so that it can rise and fall readily in opening and closing, and in combining with it an arm hinged to the post to swing with the gate, which arm carries at the swinging end a roller on which an angle plate mounted on the gate at about the center, works so as to cause the gate to rise when swinging open either way for the purpose of causing it to close by gravitation, also for preventing it from sagging at the swinging end.

Steam Wheel.—John N. Pommert, Greenfield, Ohio.—This invention relates to improvements in wheels to be propelled by steam, and consists in the application to a hollow shaft, of a cased wheel with buckets or vanes of peculiar arrangement, and a pair of radial discharging arms, the latter arranged for obtaining the reacting force of the steam after its action on the vanes of the wheel in a direct manner, to which it is admitted from below by discharging the steam obliquely upon the surface of water in a tank surrounding the shaft above the wheel.

Awning Frame.—Carl Werner, Charlestown, S. C.—This invention relates to improvements in awning frames, and consists in supporting the horizontal bar, or rod, at the outer and lower part of the frame which is commonly placed on vertical posts rising up from the ground, on arms projecting from the wall of the building, and oblique suspending irons or rods, the latter attached to the ends of the arms, and extending to the building where they are made fast at such a distance above the arms to suspend their outer ends in a very efficient manner.

Oil Cans.—Henry C. Warfel, Philipsburg, Pa.—This invention relates to improvements in oil cans of that class used for oiling machinery, and consists in the application to the spout of a plug, and a spring arranged in side of the can for closing the passage when the spring (which is forced down by the thumb) is let go. The invention also consists in the combination with the apparatus for working the plug of an air valve kept closed by a spring, and a device for opening it by the operating device for the plug, so that air will be admitted at the time the plug is opened, to facilitate the discharge of the oil; and it also consists in the application to the filling tube of a sieve for separating any solid matter from the oil that may be in it.

Brick Machine.—Samuel R. Taylor, Jacksonville, Ill.—This invention relates to improvements in brick machines, and it consists in the application to the pressing follower of a weighted lever for forcing it down to press the brick, and a mechanism for raising it, connected with the shaft of the wind mill. The invention also consists in an improved construction of the mold carriage calculated to simplify it, and to facilitate the adjustment of it with the bottom of the mill; and it also consists in an arrangement with the carriages of a clamping lever for building the mold box, in such a way that it will be forced against the box by cornering against a stop where the carriage is moved under.

Hook Attachment to Seats.—Joseph A. Dixon, New York city.—This invention consists in the attachment to the backs of chairs, benches, or other seats of public halls, theaters, churches, and the like, of self closing hat hooks, whereby the occupants of seats may be provided with the means of hanging their hats, umbrellas, canes, or other articles on the seat backs fronting them, and yet not be interfered with or annoyed when [illegible] present time [illegible] bly rooms afford no place for placing the hat except on the floor under the seat, and this place is very objectionable, as when placed therein they are frequently injured by the feet of the sitter being thrust back under the seat against them or by the unclean floor.

[illegible] tion relates to improvements in machines for cutting the tenons and notches of dovetailed joints, and consists in an arrangement of a tool-supporting frame and a gang of tools thereon for adjustment to work vertically or obliquely on either of the sides of the vertical line, for cutting the vertical walls of the notches, or the oblique walls of the tenons. The invention also consists in certain arrangements of the work supporting and feed tables for feeding the boards to have the notches with vertical walls cut in them obliquely to the plane of the boards; also for feeding when the tenons are to be cut.

Sewing Machine.—J. W. Lamb, Northville, Mich.—This invention has for its object the construction of a machine by which, with one single thread a stitch can be produced which has every new loop put first around and then through the previous loop under the fabric.

Burglar Alarm Gun.—E. T. Clegg, North Harpersfield, N. Y.—This invention relates to a new burglar alarm gun, which is so constructed that it will be operated when set in motion, and not otherwise. The instrument is applicable to buildings, gardens, etc., and may also be placed into money safes and vaults.

Churn.—Floyd Ogden, Fisherville, Ky.—This invention relates to a new [illegible] ing butter, having more especial reference to the formation of the dasher and the operation thereof in the churn.

Confectionery.—August Hells, Hoboken, N. J.—This invention has for [illegible] construct confectionery which may contain two or more pieces [illegible] ering material. The invention consists in securing a piece of crystallized sugar in another [illegible] liquid state, so that when the [illegible] firmly worked and held together.

Tubulous Boiler.—Joseph [illegible] Miller, New York city.—The object of this [illegible] water to be evaporated is co [illegible] posed to the heated products of combustion, and to allow these tubes to freely expand and contract, and without danger to such tubes or their joints.

Gang Saw.—O. C. Meigs, Dubuque, Iowa.—This invention relates to a new manner of securing gang saws to the reciprocating frames, and has for its object to provide a secure fastening and still allow the ready removal of the several saws.

Carding Machine.—Walter A. Lawton, Providence, R. I.—This invention has for its object to provide an attachment to the feed mechanism of carding engines, whereby the "feed" or sliver is properly kept on the aprons, after having been spread on the same by the traverse.

[illegible] tion with a small sheet metal or other cylinder, of an [illegible] india rubber, or other flexible and elastic substance, [illegible] portion of piston rod packing is needed, and the valves are [illegible] phragms and parts thereof, in a simple and inexpensive manner.

[illegible] — [illegible] W. [illegible], Ill.—This invention relates to improvements in bee houses and the hives therein, the said improvements being designed to furnish a simple and convenient arrangement of a number of hives in a house, to facilitate the introduction of the [illegible] the honey, and to prevent swarming.

Back Band Hook.—Henry Beagle, Jr., [illegible]—This invention has for its object to furnish a simple, cheap, strong, [illegible] hook, which shall be so constructed that it can be easily [illegible] attached to the back strap, and which will keep the traces [illegible]

[illegible]

[illegible] sion and contraction of the polishing blocks, for the [illegible] dating the same to cylinders of different diameters.

Gate.—Jackson Wright, Versailles, Ill.—This invention relates to a new and useful improvement in gates for farm and other purposes.

Mangling and Ironing Machine.—Stephen Williams, Philadelphia, Pa.—This invention has for its object to furnish an improved machine for mangling and ironing clothes and other cloths, which shall be simple in construction and effective in operation, applying the same pressure steadily to to the clothes, whatever may be their thickness, and which shall at the same [illegible]

Machine for Soldering Can Caps.—William H. Bishop, Brooklyn, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine for soldering caps upon sheet metal cans.

Propeller.—James Salter, Williamsburgh, N. Y.—The present invention relates to an improved propeller, whose fans are made flat, and [illegible] countersunk in the hub, to which they are held secure by means of suitable braces, provided with nuts and screws to adjust the pitch.

Bee Hive.—William A. Ruth, Wyoming, Del.—This invention relates to a hive constructed with a central chamber for occupancy [illegible] side boxes opening therefrom, to be withdrawn after [illegible]

[illegible] Caster.—[illegible]—This invention relates to a caster of that class in [illegible] volving arms which bear the rings that hold the bottles or cruets, and the invention consists in the adaptation of such radial arms to the purpose of [illegible] spoon or fork.

Friction Clutch.—Walter W. Jerome, Samuel R. Alger, and Clint [illegible] Sage, Norwich, N. Y.—This invention has for its object to furnish an [illegible] either greater or less than one fourth.

Apparatus for Clarifying Cane Juice with Sulphurous [illegible] affecting cane juice and other liquids by the application of [illegible] gas, or other gases, which shall be simple in construction and effective in operation.

[illegible]—This invention has for its object to furnish an improved means for forging the heads for fifth wheels, finishing their tops or upper sides, and finishing their front and rear ends ready for welding.

Pile Driver.—Jacob Ray, Whistler, Ala.—This invention has for its ob[illegible]

Log Guide for Circular Saw Mills.—Benjamin Fitts, Toledo, Ohio.—This invention relates to a new and useful improvement in a device for governing the set of the log in circular saw mills, by means of which a uniform thickness in the boards sawed is secured.

Automatic Chimney Top.—M. E. Mead, Darien, [illegible] vention relates to a new and improved automatic [illegible] a metallic hook pivoted to the chimney, and operated [illegible] striking against one or more vanes, whose supporting rods [illegible] staple in one or both sides of the said hood, and are pl[illegible] sufficient distance below to give an easy swing, and by [illegible] weight attached to the end of each rod, it will necessarily be sensitive to the least air stirring, thus always closing on the windward side and opening on the lee side of the chimney.

Stump Joints for Carriage Top Braces.—Frederick Van Patten and E. D. Clapp, Auburn, N. Y.—This invention has for its object to furnish improved joints for carriage-top braces, known among carriage builders as "stump joints," which shall be so constructed as to facilitate the labor of welding them to the round or oval iron that forms the arms of the braces, the joints being so forged and finished that they can be easily welded by the smith without injury to the joint or to the milled and finished parts.

Safety Swivel for Chains.—Richard Richards, Albany, N. Y.—This invention has for its object to furnish an improved safety swivel for connecting watches to their chains, which shall be simple in construction, easily attached and detached, and which shall, at the same time, be strong, secure, [illegible]

Stamp and Canceler.—Augustus Zenlinger, Louisville, Ky.—The object of this invention is to produce an instrument that shall make a clear and [illegible] It consists in the provision of a globular [illegible] stamp canceler, the same fitting in [illegible] having elastic blocks so arranged as to relieve the parts from the concussion incident to the use of the stamp.

Sewing Machines.—C. H. Palmer, New York city.—This invention relates to improvements in attaching needles to the arms or posts of [illegible] machines, the said improvements being designed more especially for attachment of those needles which are split or divided [illegible] wards for the purpose of receiving the thread into the [illegible] the eye through a slot leading from a large hole in the needle [illegible] which the thread is passed, but the said improvements are also [illegible] the needles of ordinary construction, and are calculated to hold [illegible] firmly than the present arrangements. The said improvements [illegible] providing grooves in the face of one of the parts, by which they [illegible] to the needle post or arm, in which grooves the lugs or arms of [illegible] ends of the said divided needles are fitted, or similar lugs or [illegible] common needles may be fitted to be held by the other part of the [illegible]

[illegible] has for its object to furnish [illegible] shall, at the same time, be simple in construction [illegible] is operated.

MOWERS AND REAPERS.—Solomon Rawson and Isaac Rawson, Almond, N. Y.—This invention consists in the method of connecting the lower supplementary frame, to which the cutter and sickle bars are hinged, with the main frame to which the tongue is attached, whereby a leverage is exerted calculated to lessen the draft strain; and also in the employment of a spring bar or plate for connecting a caster wheel with said lower frame for the purpose of supporting it at the front end.

ATTACHABLE AND DETACHABLE BASTER FOR SEWING MACHINES.—Dr. F. T. Grimes, Liberty, Mo.—This invention consists of a rod to be attached by any convenient means to the cloth table of a sewing machine, or to an adjustable plate connected with the cloth table, said rod being provided with arms at its ends, one of which arms is furnished with teeth, while to the other is fastened one extremity of an elastic strip, that is also furnished with teeth at its other extremity, which teeth are fastened into the fabrics to be sewed together, and into these fabrics, after being duly stretched, the teeth of the arm aforesaid are inserted, by which means the cloth is kept smoothly extended, and prevented from drawing or puckering.

WAGON BRAKE.—James Robinson, Sedalia, Mo.—This invention relates to improvements in wagon brakes, and it consists in an arrangement of the brake blocks on separate levers mounted so that the blocks may be drawn under the box when released from the wheels, to prevent an accumulation of mud on them, and be thrown out again, previous to being forced on to the wheels, by a combination, with the said levers and the ordinary brake operating lever, of apparatus for so operating the brakes by the said lever when applying or releasing the brakes.

APPLICATIONS FOR EXTENSION OF PATENTS.

ABDOMINAL SUPPORTER.—Julia M. Milligan, New Albany, Ind., has petitioned for an extension of the above patent. Day of hearing Jan 25, 1871.

WINDOW BLINDS.—Daniel Kelley, Muskegon, and William Livingston, Grand Rapids, Mich., have petitioned for an extension of the above patent. Day of hearing Jan. 25, 1871.

TRUSS BRIDGE.—Reuben Comins, Troy, N. Y., has petitioned for an extension of the above patent. Day of hearing Jan. 25, 1871.

MACHINE FOR PARING APPLES.—David H. Whittemore, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing Feb. 1, 1871.

WAGON.—Edgar Huson, Ithaca, N. Y., has petitioned for an extension of the above patent. Day of hearing Feb. 1, 1871.

MARKING SLATE.—John W. Hoard, Providence, R. I., has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

OPERATING VALVE OF STEAM ENGINES.—Samuel R. Wilmot, Bridgeport, Conn., has petitioned for an extension of the above patent. Day of hearing Feb. 1, 1871.

SOLAR CAMERA.—David A. Woodward, Baltimore, Md., has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

HINGE.—John D. Brown, Cincinnati, Ohio, has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

Official List of Patents.

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FOR THE WEEK ENDING Nov. 29, 1870.

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109,569.—CUTTING APPARATUS FOR HARVESTERS.—Joshua L. Abell, Cummington, Mass. Antedated Nov. 12, 1870.
109,570.—RUBBER CEMENT.—H. J. Ball, Oswego, N. Y. Antedated Nov. 19, 1870.
109,571.—APPARATUS FOR TREATING CANE JUICE WITH SULPHUROUS ACID GAS.—John W. Austin, Plaquemine, La.
109,572.—BACKHAND HOOK.—Henry Beagle, Jr., Philadelphia, Pa.
109,573.—SPIRAL SPRING FOR BEDSTEADS.—W. L. Beardsley, Binghampton, N. Y.
109,574.—SHUTTLE FOR SEWING MACHINES.—Walter Bennett, Springfield, Ill.
109,575.—RIVETING MANDREL.—James Berry, Buffalo, N. Y.
109,576.—CHEMICAL FIRE EXTINGUISHER.—Edmund Bigelow, Springfield, Mass.
109,577.—MACHINE FOR SOLDERING CAN CAPS.—W. B. Bishop, Brooklyn, N. Y.
109,578.—COMPOSITION FOR THE MANUFACTURE OF BOOT AND SHOE HEELS.—Carl Bocking, Boston, Mass. Antedated Nov. 12, 1870.
109,579.—ELASTIC ROLLER FOR WRINGERS, ETC.—Augustus Bourn, Providence, R. I.
109,580.—CLOTHES PIN.—George Bradley and N. A. Walker, Rockford, Ill. Antedated Nov. 11, 1870.
109,581.—CONSTRUCTION OF GLOBES, MAPS, ETC., FOR SCHOOLS.—John De Witt Brinckerhoff and James Dublin, Morrisania, N. Y.
109,582.—ARM SUPPORT FOR KEYED INSTRUMENTS.—Leopoldin Buchberger, Chicago, Ill. Antedated Nov. 12, 1870.
109,583.—ROLLER TEMPLE FOR LOOMS.—W. H. Burns, Grafton, assignor to Jonathan Luther, Worcester, Mass.
109,584.—CORN DROPPER.—Major H. W. Caldwell, Jackson, Ohio.
109,585.—HEMMER AND FELLER FOR SEWING MACHINES.—Cyrus Carleton, Brooklyn, N. Y., assignor to Wilcox & Gibbs Sewing Machine Co., New York city.
109,586.—HORSESHOE BAR.—Ebenezer Cate, Watertown, Mass.
109,587.—HYDRANT.—Elias Clampitt, Baltimore, Md.
109,588.—BURGLAR ALARM.—E. T. Clegg, North Harpersfield, N. Y.
109,589.—GLOBE FOR GAS LIGHTS.—Charles Collier, Selma, Ala.
109,590.—COMBINED RAILROAD JACK AND PINCH BAR.—M. G. Collins, Meadville, Pa.
109,591.—MACHINE FOR MAKING KEY BOARDS FOR WOOD PAVEMENTS.—F. H. Cummings, Portland, Me.
109,592.—FILTER.—George Curtis (assignor to himself and E. Bigelow), Springfield, Mass.
109,593.—FILTER.—George Curtis (assignor to himself and E. Bigelow), Springfield, Mass.
109,594.—COMBINED VISE AND DRILL.—Otis Dean, Richmond, Va.
109,595.—BOILER FOR PREPARING PAPER PULP.—Lorenzo Dean, Fort Edward, N. Y.
109,596.—PREPARATION OF STRAW FOR THE MANUFACTURE OF PAPER.—Lorenzo Dean, Fort Edward, N. Y.
109,597.—ASPHALT PAVEMENT.—E. J. De Smedt, New York city.
109,598.—HOOK ATTACHMENT FOR SEATS.—Joseph A. Dixon, New York city.
109,599.—HEALING SALVE.—Robert Dobbins, Binghampton, N. Y.
109,600.—PROJECTILE.—Ellis Drake, Stoughton, Mass.
109,601.—APPARATUS FOR THE MANUFACTURE OF OZONE.—C. F. Drenderdale, New York city.
109,602.—CASTER AND SPOON HOLDER COMBINED.—L. Evans, Pittsburgh, Pa.
109,603.—THERMO-ELECTRIC BATTERY.—M. G. Farmer, Salem, Mass.
109,604.—REVERSIBLE BUTT.—G. W. Field (assignor to himself and Robert H. Batcher), Lowell, Mass. Antedated November 12, 1870.
109,605.—LOG GUIDE FOR CIRCULAR SAW MILLS.—Benjamin Fitts, Toledo, Ohio.
109,606.—FENCE.—Rodolphus J. Flanner, Plainfield township, Mich.
109,607.—MANUFACTURE OF ARTIFICIAL STONE.—W. H. Foye, San Francisco, Cal.
109,608.—ELASTIC RUNNING GEAR FOR CARRIAGES.—G. E. Garretson, Russellville, Ky.
109,609.—GATE.—Elijah Gemberling, Elkhart, Ind.
109,610.—POLISHING MACHINE.—John Gooden, Lockport, N. Y. Antedated November 26, 1870.
109,611.—APPARATUS FOR AGING WHISKEY AND OTHER LIQUORS.—John P. Gowley, Boston, Mass. Antedated November 26, 1870.
109,612.—ATTACHMENT FOR SEWING MACHINES.—Franklin T. Grimes, Liberty, Mo.
109,613.—COMBINED SEED SOWER AND CULTIVATOR.—H. L. Hall, Woodbridge, Iowa.
109,614.—ANIMAL TRAP.—William R. Hampton, Fairfield, Ill.
109,615.—PHOTOGRAPHIC PRINT CUTTER.—John Haworth, Philadelphia, Pa. Antedated Nov. 26, 1870.
109,616.—STEAM GENERATOR.—John Houpt, Springtown, Pa.
109,617.—GARTER.—H. A. House, Bridgeport, Conn.
109,618.—AUTOMATIC ROPE WALKER.—H. A. House, Bridgeport, Conn.
109,619.—ADDING AND SUBTRACTING REGISTER.—H. A. House, Bridgeport, Conn.
109,620.—COMBINING KEYS WITH WATCHES.—Alfred Humbert (assignor to himself and Gustavus Giger), Philadelphia, Pa.
109,621.—MANUFACTURE OF PAPER.—C. B. Hutchins, Ann Arbor, Mich.
109,622.—WATER ELEVATOR.—T. H. Hutchinson, Gorham, N. H.
109,623.—PILE DRIVER.—Jacob Huy, Whistler, Ala.
109,624.—PUMP.—Joseph Icard, Donaldsonville, La.
109,625.—FRUIT JAR.—C. G. Imlay and W. L. Imlay, Philadelphia, Pa.
109,626.—EMBELLISHMENT OF GLASS.—Elias Ingraham, Bristol, Conn.
109,627.—HEATING STOVE.—G. B. Isham, Burlington, Vt. Antedated November 17, 1870.
109,628.—TRUSS BRIDGE.—William Johnson, Lambertville, N. J.
109,629.—CULTIVATOR PLOW.—T. F. Jones, Hick's Ford, Va.
109,630.—MACHINE FOR CUTTING, SCORING, AND CORNERING PAPER FOR BOXES.—J. M. Keen (assignor to himself and C. C. G. Armslingi), Philadelphia, Pa.
109,631.—PUMP.—H. K. Kenyon, Steubenville, Ohio, assignor to himself and Jared M. Hays & Co., Erie, Pa.
109,632.—SEWING MACHINE.—I. W. Lamb, Northville, Mich.
109,633.—ELECTRO-PLATING IRON AND STEEL WITH SILVER.—Alexander Lowe, Kingston, Canada.
109,634.—FEED MECHANISM FOR CARDING MACHINES.—W. A. Lawton, Providence, R. I.
109,635.—LIFTING JACK.—S. C. Leonard, Oberlin, Ohio.
109,636.—FIFTH WHEEL.—Joseph Le Roy, Marathon, N. Y.
109,637.—PIER FOR BRIDGES.—C. H. Lilienthal, Yonkers, N. Y.
109,638.—DEODERIZING THE AIR AND GASES IN FAT RENDERING, BONE BOILING, ETC.—Alfred Lister, Edwin Lister, and C. J. Eames, Newark, N. J.
109,639.—PUMP.—Charles Markley, New York city.
109,640.—BOLT.—F. G. McClelland, Attica, Ohio. Antedated November 25, 1870.
109,641.—HAT.—J. W. McGill, Washington, D. C.
109,642.—CHIMNEY TOP.—M. E. Mead, Darien, Conn.
109,643.—GAGE FOR GANG SAWS.—O. C. Meigs, Dubuque, Iowa.
109,644.—VEHICLE.—F. H. C. Mey, Buffalo, N. Y. Antedated September 17, 1870.
109,645.—STEAM GENERATOR.—J. A. Miller, Boston, Mass.
109,646.—MANUFACTURE OF GLASS ARTICLES.—C. A. Moore, Westbrook, Conn.
109,647.—CLOTHES DRYER.—W. N. Moore and A. K. Moore, Neenah, Wis.
109,648.—TOWEL RACK.—Frederick Myers, New York city.
109,649.—METALLIC AND ELASTIC STAIR PLATE.—P. W. Neefus, New York city. Antedated November 26, 1870.
109,650.—METALLIC AND ELASTIC DOOR MAT.—P. W. Neefus, New York city. Antedated November 26, 1870.
109,651.—STAIR AND FLOOR PLATE.—P. W. Neefus, New York city. Antedated November 26, 1870.
109,652.—STEAM GENERATOR.—Eugen Neumann, New York city, assignor, by mesne assignments, to C. D. Tyler, Newark, N. J.
109,653.—HAND POWER BALING PRESS.—W. H. Newman, Galesburg, Ill.
109,654.—CHURN DASHER.—Floyd Ogden, Fisherville, Ky.
109,655.—SEWING MACHINE.—John Palmer, Randolph, Mass.
109,656.—COMPOUNDS FOR BATING HIDES AND SKINS.—C. F. Panknin, Charleston, S. C. Antedated November 26, 1870.
109,657.—COMBINED GARDEN TOOL.—Louis Perrot, Greenville, and Frank Perrot and C. H. Bates, Appleton, Wis.
109,658.—ENAMELED CAST-IRON RETORT.—T. D. Phillips, Cassadaga, and T. S. Phillips, assignors to B. S. Brown and T. S. Phillips, Buffalo, N. Y.
109,659.—STEAM WHEEL.—J. N. Pommert, Greenfield, Ohio.
109,660.—MATCH FOR CIGAR LIGHTERS.—William Porter, St. Stephen's Parish, Canada.
109,661.—SHUTTER WORKER.—C. A. Potter, Providence, R. I. Antedated November 26, 1870.
109,662.—CLOTH-CUTTING ATTACHMENT FOR SEWING MACHINES.—W. E. Prall, Washington, D. C., and A. B. Rand, Staten Island, N. Y.
109,663.—SHOW CASE.—Philip Price, West Chester, Pa.
109,664.—WATER WHEEL.—Demmon Reynolds, Napanock, N. Y.
109,665.—MANUFACTURE OF WRENCH.—John Richards, Philadelphia, Pa.
109,666.—SAFETY SWIVEL.—Richard Richards, Albany, N. Y.
109,667.—EARTH CLOSET.—George W. Roberts (assignor to himself and John R. Graham), Wilmington, Del.
109,668.—CLOTH-GUIDING ATTACHMENT FOR SEWING MACHINES.—Seamon Rogers and Edwin K. Sperry, Flushing, N. Y. Antedated November 26, 1870.
109,669.—MANUFACTURE OF ARTIFICIAL STONE.—James L. Rowland, Milwaukee, Wis.
109,670.—RAILWAY FROG.—John C. Rupp, Newark, Del.
109,671.—COCK FOR CARBURETERS, ETC.—Samuel Rust, Jr., Cincinnati, Ohio.
109,672.—BEE HIVE.—Wm. A. Ruth, Wyoming, Del.
109,673.—PROPELLER.—James Salter, Williamsburgh, N. Y.
109,674.—DOVETAILING MACHINE.—John B. Schmid, Salem, Va.
109,675.—DOVETAILING MACHINE.—John B. Schmid, Salem, Va.
109,676.—ELEVATOR.—George Scott, New Orleans, La.
109,677.—CONFECTIONERY FOR DRUGGISTS.—August Seitz, Hoboken, N. J.
109,678.—PUMP.—Wm. Shearer, Atlanta, Ga.
109,679.—AGRICULTURAL CALDRON.—E. E. Sill and A. H. Bennet, Rochester, N. Y.
109,680.—GRAIN AND FRUIT-CLEANER.—Silas A. Slonaker, Philadelphia, Pa.
109,681.—AXLE FOR CARRIAGES.—Alfred E. Smith, Bronxville, N. Y.
109,682.—SLEIGH.—Samuel S. Spear, South Weymouth, Mass.
109,683.—CURTAIN FIXTURE.—Thomas Stewart, Philadelphia, Pa.
109,684.—WHEEL PLOW.—John E. Swallow, Hagerstown, Md.
109,685.—WATER WHEEL.—Wm. A. Terry, Bristol, Conn.
109,686.—APPARATUS FOR MARKING CLOTH.—Alfred Thomas, Hoboken, N. J.
109,687.—APPARATUS FOR MARKING CLOTH.—Alphonse Thomas, Hoboken, N. Y.
109,688.—RECORDING INSTRUMENT FOR THE ELECTRIC TELEGRAPH.—Wm. Thomson, Glasgow, Scotland.
109,689.—AUTOMATIC STOVE REGISTER.—J. S. Toan, Rochester, N. Y.
109,690.—STRETCHING-FRAME.—John Tonner, Canton, Ohio.
109,691.—SIRUP-CAN.—Antony Tumler, New York city.
109,692.—BUFFER AND CATCH FOR BOOTS.—A. A. Veer, Delaware, Ohio.
109,693.—OIL CAN.—Henry C. Warfel, Philipsburg, Pa.
109,694.—AWNING FRAME.—Christopher Werner, Charleston, S. C.
109,695.—ATMOSPHERIC CAR-BRAKE PIPES.—George Westinghouse, Jr., Pittsburgh, Pa.
109,696.—VIOLIN.—M. W. White (assignor to himself and E. P. Cutter), Boston, Mass.
109,697.—WASHING MACHINE.—L. H. Whitney, Washington, D. C. Antedated November 19, 1870.
109,698.—DANCING TOY.—George L. Wild and Louis P. Wild, Washington, D. C.
109,699.—MANGLING AND IRONING MACHINES.—Stephen Williams, Philadelphia, Pa.
109,700.—HORSE HAY RAKE.—James E. Wisner, Friendship, N. Y.
109,701.—HORSE OR MULE SHOE.—John Wonderlin, Louisville, Ky.
109,702.—BEE HOUSE.—James W. Wood, Alden, Ill.
109,703.—FASTENING FOR FRUIT JARS.—T. F. Woodward, Winslow, N. J., assignor to Hay & Co., Philadelphia, Pa.
109,704.—GATE.—Jackson Wright, Vermillion, Ill.
109,705.—SEWING MECHANISM.—Josiah L. Young, San Francisco, Cal. Antedated November 16, 1870.
109,706.—DRYING DISINTEGRATED FIBERS.—Wm. Adamson, Philadelphia, Pa.
109,707.—CARRIAGE-WHEEL HUB.—Simeon Atha, West Liberty, Ohio.
109,708.—TRAVERSE MOTION FOR WINDING AND SPOOLING MACHINERY.—John E. Atwood, Mansfield, Conn.
109,709.—PULLEY COUPLING.—John E. Atwood, Mansfield, Conn.
109,710.—WASHING MACHINE.—B. C. Bailey, Constitution, Ohio.
109,711.—GRATE BAR.—Hosea Ball, New York city.
109,712.—IRONING BOARD.—Jacob H. Beidler, Adrian, Mich.
109,713.—GATE.—Robert T. Bowne, Fallston, Md.
109,714.—TANNING COMPOSITION.—William B. Brittingham, La Fayette, Ind.
109,715.—PLATE-LIFTER.—Heman P. Brooks, Waterbury, Conn.
109,716.—RIDDLE FOR SEPARATING GRAIN.—Matthew M. Cooper and James W. Donaldson, Fairfield, Cal.
109,717.—PADLOCK.—Joseph Corbett, Brooklyn, N. Y.
109,718.—SEAL-LOCK.—Joseph Corbett, Brooklyn, N. Y., and Franklin W. Brooks, New York City, assignors to the American Seal-Lock Company, New York City.
109,719.—HARROW-TEETH.—Squire W. Corbin, Bainbridge, N. Y.
109,720.—FLY-BRUSH.—James E. Darnall, Washington, D. C.
109,721.—OSCILLATING PISTON-ENGINE.—James B. Davis and Seth M. Davis, Harrisonville, Mo.
109,722.—PACKING-BOX FOR ROTARY STEAM-CYLINDERS.—Samuel Deacon and John Russell, Lawrence, Mass.
109,723.—ELECTRO-MAGNETIC BURGLAR-ALARM.—James Madison Dille, Coopertown, Pa.
109,724.—CONCRETE FOR PAVING AND ROOFING.—Edward Durmpelman, New York City.
109,725.—MACHINE FOR CUTTING SHEETS OF INDIA-RUBBER.—Charles A. Ensign, Naugatuck, Conn.
109,726.—MACHINE FOR JOINING IRREGULAR SEAMS IN INDIA RUBBER WORK.—Charles A. Ensign, Naugatuck, Conn.
109,727.—RAILWAY-CAR BRAKE.—Francis M. Finnell, Covington, Ky.
109,728.—SHOE.—John W. Fisher, Albany, N. Y.
109,729.—SHOE.—John W. Fisher, Albany, N. Y.
109,730.—FAUCET.—Oscar Hanks, Cincinnati, Ohio. Antedated November 19, 1870.
109,731.—BREECH-LOADING FIRE-ARM.—John Hanson, Rashcliffe, near Huddersfield, England.
109,732.—AIR-PUMP.—John F. Haskins, Fitchburg, Mass.
109,733.—CLOTHES-LINE FASTENER.—Bryant B. Herrick, (assignor of one-half his right to John H. Wallace,) Decatur, Mich.
109,734.—FLOOD-GATE.—Nathaniel Hinckley, Marston's Mills, Mass. Antedated November 26, 1870.
109,735.—SAFETY-TUBE FOR LAMPS.—George M. Hopkins and John A. Wright, Albion, N. Y.
109,736.—GARTER.—Henry A. House, Bridgeport, Conn.
109,737.—GARTER.—Henry A. House, Bridgeport, Conn.
109,738.—FLUTING-MACHINE.—Arthur Y. Hubbell, Elmira, N. Y.
109,739.—PACKAGE FOR LARD, BUTTER, ETC.—George M. Huntly, Grand Rapids, Mich.
109,740.—FRICTION-CLUTCH.—Walter W. Jerome, Samuel B. Alger, and Clinton H. Sage, Norwich, N. Y.
109,741.—ROTARY PLOW.—Nelson T. Judd, Washington, D. C.
109,742.—PAPER-STOCK.—Morris L. Keen, Jersey City, N. J., assignor to himself and Samuel A. Walsh, New York City.
109,743.—SEPARATING LEAD FROM THE PRECIOUS METALS.—Solomon W. Kirk (assignor to himself and William Bailey), Philadelphia, Pa.
109,744.—FAN ATTACHMENT FOR ROCKING-CHAIRS.—Rudolph Knaffl, Nashville, and Theodore M. Schleier, Knoxville, Tenn.
109,745.—RAMMING-MACHINE FOR WOOD AND OTHER PAVEMENTS.—Arthur Livingston Lansing (assignor to Henry Seymour Lansing), Philadelphia, Pa.
109,746.—DEVICE FOR CUTTING SCREW-THREADS AND FOR DRILLING METALS.—James W. Mabbs, Brooklyn, N. Y.
109,747.—DEVICE FOR CLAMPING OR CUTTING OFF TUBES AND RODS.—James W. Mabbs, Brooklyn, N. Y.
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REISSUES.

4,185.—ATTACHING SLEIGH BELLS TO STRAPS.—William E. Barton, East Hampton, Conn.—Patent No. 46,435, dated March 7, 1865.
4,186.—STEAM GENERATOR.—American Gerner Boiler Co., New York city, assignees of Henry Gerner.—Patent No. 73,593, dated Jan. 21, 1868. Division B.
4,187.—AUGER HANDLE.—J. M. Horton, Chicago, Ill., assignor to "The Miller's Falls Manufacturing Co.," Miller's Falls, Mass.—Patent No. 35,656, dated July 8, 1862, reissue No. 1,296, dated April 17, 1866.
4,188.—VESSEL FOR BREWING.—Werner Krueger (assignor to Wm. Frankfurth), Milwaukee, Wis.—Patent No. 63,495, dated March 26, 1867.
4,189.—STONE CHANNELING MACHINE.—E. O. Lamson, Windsor, Vt.—Patent No. 96,265, dated April 26, 1869.
4,190.—SCHOOL DESK.—C. H. Lewnde, New Philadelphia, O.—Patent No. 98,473, dated June 8, 1869.
4,191.—SKATE FASTENING.—Harshaw Scott, New York city, assignee of Henry Pickford.—Patent No. 16,883, dated February 17, 1866.

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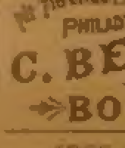

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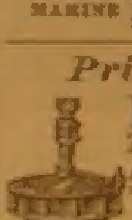

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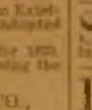

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